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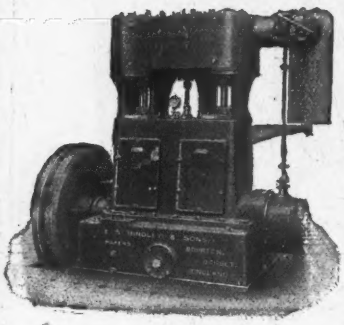

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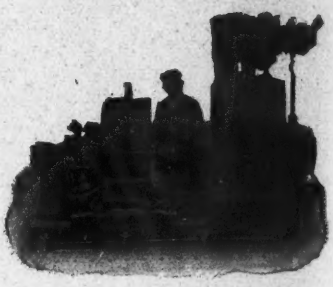

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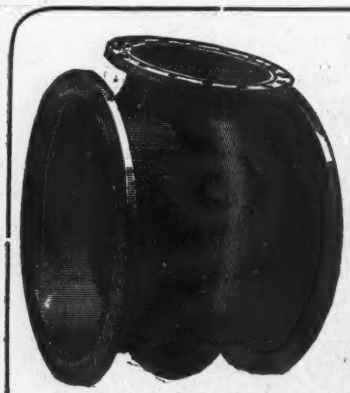

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ELECTRICAL REVIEW.

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WANTED: A POLICY.

DURING the 22 years which have passed since its formation, the Municipal Electrical Association has enjoyed the distinction of being the only organised body in the country which can boast of having as its single aim the bringing of electricity supply within the reach of every class of consumer. Admittedly, municipal control has been found wanting in some respects—there are limitations in a system of government "by the people, for the people," and past legislation has by no means tended to give electricity suppliers a broad view of their responsibilities—but this has not deterred the Association from steady purposeful effort with a view to furthering electricity supply under municipal auspices, and it is only fair to admit that the excellent work thus far accomplished under the guidance of the Association has to a large extent disarmed biased criticism of municipal control. Such being the case, the abrupt demand by Mr. Roles, at the annual general meeting of the Association on Friday last, that the Council should formulate a definite policy, and especially the darksome hints as to the future, which accompanied the demand, together with other remarks let fall during the meeting, "give one furiously to think."

The established methods of electricity supply in this country are admittedly inadequate to the future needs of its population; that this has been realised is shown by the formation of the Board of Trade Committee and the terms of reference to the latter. While no fault can be found with these terms, it is obvious that the constitution of the Committee which is "to consider and report, &c.," may be open to considerable criticism, which it has, in fact, received, the municipal authorities claiming with considerable justice that they were not adequately represented, and having now secured further representation. Whether this change will restore the confidence of all parties we do not know. It is possible that the Committee has given the impression that it is a tribunal with a partiality for private enterprise, and, therefore, a strong distaste for municipal trading in any shape or form; such an assumption would be justified by the composition of the Committee, which includes too many governmental representatives and too few central-station men.

It would be a matter for regret if the idea that electricity supply methods were on their trial was interpreted to mean that municipal supply methods were the culprits! In any case, not the system, but its originators are deserving of blame, and they, in fact, belonged to the class which has supplied a considerable proportion of the present committee.

The fundamental, though unwritten, policy of the municipal fraternity, as we have understood it, has always been the supply of electricity at the lowest possible price; such a policy necessarily involves a somewhat visionary profit margin, even in normal times, and is thereby differentiated from private control in which the profit margin must naturally be the first consideration.

Leaving aside the alternative evils of possible political jobbery in municipal control, and equally possible financial juggling in private enterprise, it should not be a matter of difficulty to determine which type of control has most nearly ensured—in the terms of the Committee's reference—"an adequate and economical supply of electric power for all classes of consumers."

If it be acknowledged that a cheap supply of electricity is a basic necessity of modern industry, that it is an indispensable factor in the prosperity of the country—and the formation of a Government committee to consider the question leaves no doubt on this matter—then it is difficult to recognise any other conditions than those of public service as applying to it, and it remains to be seen whether private enterprise can entertain such conditions. Municipal control is "too public," and company control "too private" to invite all-round confidence. It may be many years before the latter will find in cheap electricity supply a source of dividends; nevertheless, cheap electricity is the need of the hour, and "for all" should be the motto of the supply industry of this country.

A Government Register of Export Manufacturers.

AN interesting announcement is made by the Board of Trade. In the first instance it relates to boots, clothing, fancy goods, and so forth—in all seven classes of manufactures are mentioned—but presumably it is not the intention to stop at these. The Board of Trade is compiling (in its Department of Commercial Intelligence) an Index or Directory of British and Irish manufacturers which it is proposed to forward to Consular Officers, Trade Commissioners, and other correspondents of the Board abroad for use in dealing with inquiries which they may receive for the supply of British and Irish goods both now and for delivery after the war. That there was room for something of this kind on a large scale has long been recognised by us, as reference to our pages several years before the war will testify. We endeavoured to meet the want so far as the electrical engineering and allied trades were concerned by communicating with all the principal consuls, commercial attachés, and trade commissioners on the matter, and, as one result of the very interesting correspondence which ensued, we placed the ELECTRICAL REVIEW on file in the offices of these officials for their own use as inquiries arose concerning electrical manufactures for which a name of maker was required, and for the use of callers who wished to see what British manufacturers were making, and able to make, from their own announcements, and from editorial articles. The advantage of having access to such records is that they are, speaking generally, kept well up-to-date. The Board of Trade scheme is to publish a Directory which will presumably contain information which does not appear in the ordinary trade directories, of which, of course, there is no dearth. But it will only be complete, apparently, if every British manufacturer interested in the export trade sends in his particulars. The present invitation to him, in regard to the trades named, is to supply a detailed list of the articles which he manufactures; a list of the markets abroad in which he is more particularly interested; particulars of his agents abroad and of his terms of business; also any other information that would be of use in enabling inquiries from prospective purchasers to be adequately dealt with. We believe that while traders generally will agree that such a record should have been prepared years ago, it will be very necessary for after-the-war operations if Government Departments are going to adopt an active policy of assistance for our export industries. We believe that such is the national desire and the Departmental intention, but everything depends upon the reliability of the list, and the enterprise and activity displayed in using it. It will also require revision from time to time, both as to firms and as to the details of their manufactures. But however complete and reliable the list in these respects, it will not take the place of the direct intimacy that our national commercial representatives abroad should have with our actual industries at home. Nor will it in any way lessen the necessity for the advertiser giving all the information possible in his advertisements in such trade organs as find their way to colonial and foreign markets. As we have frequently said in these pages, the buyer—often right beyond the reach of Government offices, and almost out of touch with ordinary civilisation—looks to advertisements for telegraphic addresses, codes employed, and so forth, and for illustrations of types of manufactures or actual works carried out. Government directories are an excellent idea, and, as a foretaste of good foreign trade policy to come, we welcome them, but, after all, they will be but a small instalment of the organisation that is necessary to inform the purchasing world of the ability of British manufacturers to make practically anything that is required, to make it well, and to sell it without undesirable Hunnish methods.

High-pressure Rectified Alternating Currents.

AMONGST the newer applications of electricity to technology there is an interesting, but remarkably diversified, group connected together by one dominant characteristic—the use of rectified alternating current at very high pressures. The three applications which comprise this group all happen to be referred to in this issue of the ELECTRICAL REVIEW; they are electroculture, the precipitation of fumes, and X-rays. The pressures required range from 50,000 to 200,000 volts, the powers from 5 to 50 KW., and in each case a transformer is employed, in conjunction with either an A.C. supply or a D.C. interrupter in the primary circuit. Rectification may be effected either by a mechanical rectifier or an electrical "valve." The commercial importance of the X-ray industry is already obvious; that of the precipitation process has been fully established by the admirable work done mainly in the United States; that of electroculture is continually gaining in appreciation, and bids fair to leave its rivals far in the rear.

Here, then, is a singularly promising field for development, combining the certainty of immediate returns with the possibility, and probability, of enormous expansion in the early future, together with wide scope for the invention of improved apparatus and methods. Several British firms are admirably equipped with plant and organisation to handle this class of business successfully, and we trust that they are fully awake to the splendid prospect which it offers to energetic and enterprising exploitation.

THE MEETING OF THE INCORPORATED MUNICIPAL ELECTRICAL ASSOCIATION, 1917.—II.

IN our last issue we referred to the meeting of the I.M.E.A., which took place at the Institution of Civil Engineers, on Thursday and Friday, last week. Although of such brief duration, and with many familiar faces absent, the gathering was a representative one, and served a useful purpose.

The PRESIDENT, Mr. F. M. Long, in opening the proceedings, suggested that the meeting should send congratulatory messages to Major W. A. Vignoles, of Grimsby, on being awarded the D.S.O., and to Captain Barker, of Barnsley, who has received the Military Cross; also that a message of remembrance be forwarded to Major H. Richardson, of Dundee, and others on active service, and this was agreed to.

Then followed the reading of the presidential address, to which we referred at some length in our last issue; a vote of thanks to the President was proposed by ALD. LEESE, Stoke-on-Trent, and seconded by MR. W. A. CHAMEN, who, touching on the address, said he thought the proposed Electricity Bill should go forward in any case, as it might be a considerable time before a Government Electricity Board or Department came into being.

MR. BOWDEN then explained briefly the scope of his paper on "Individual Interest in Municipal Enterprise," and the discussion which followed occupied the remainder of the morning; abstracts of both paper and discussion are appended.

After an adjournment for lunch, the reading and discussion of MR. ROBERTSON'S paper on "Fuel Economy" occupied the afternoon; both papers were well received, the speakers being generally in agreement with the authors, though possibly some misgivings may be felt as to the attitude of labour in regard to bonus schemes, and some doubt as to the present and future values of by-products and the cost of obtaining them—and these are, after all, fundamental matters in profit sharing and coal economy.

The general business meeting of the Association took place on Friday morning, and the question of coal economy was again brought forward, this time by MR. GUY CALTHROP, Controller of Coal Supplies, who took the opportunity of briefly addressing the meeting on the subject.

MR. CALTHROP said no interference with industry was intended, unless it was essential in the national interests, but it was desired to co-ordinate the use of coal, and the two problems to be faced were the supply of London during the coming winter and the general transport of coal. He pointed out that the war was largely a transport problem. They had a scheme in hand with the object, as far as possible, of consuming coal near the place of origin, which affected some 40 million tons, and would save 700 million ton-miles in transport. He agreed that electricity producers were expert coal economists, but though the seven million tons annually used by electric lighting, tramway, and railway undertakings was a small proportion of the 240 million tons consumed, even in this economies were advisable, and he urged them during the summer to economise for winter use. The transport difficulty would not end with the war, and difficulties were anticipated next winter. He realised the necessity of their work, but appealed to them to assist him if possible. As far as he was able, he intended to see that the Price of Coal Limitation Act was carried out.

The PRESIDENT assured Mr. Calthrop of their willingness to assist him, and a number of questions were asked. MR. ELLIS (South Shields) pointed out the difficulty of getting the appliances which would enable them to economise in fuel, and suggested that some arrangement between the Coal Controller and Ministry of Munitions might be made to get over the difficulty, while MR. YEAMAN (Stoke-on-Trent) touched on the question of reduced quantities of local coal under contracts, necessitating using distant coal at increased cost. MR. F. AYTON (Ipswich) pointed out the disadvantages in the way of cost, labour, haulage, and decreased plant efficiency, of the dirty coal now supplied, and asked whether this matter could be remedied; and MR. CLOTHIER (Bootle) said they could not agree that the Board of Trade decisions conformed with the Price Limitation Act, and asked whether the matter could be opened again.

MR. CALTHROP, in reply, briefly assured them that he would endeavour to obtain reasonable priority for new fuel plant, and would assist them in the matter of dirty coal and reduced quantities supplied under contract, if particulars were given. Mr. Calthrop then withdrew.

The annual report, an abstract of which appears below, then came up for discussion. With reference to the Council's recommendation that the resolution of 1913, in regard to the "Model general conditions of contract," should be rescinded, and the matter be left in the hands of the Council, MR. PURSE (Carlisle) moved an amendment, in the form of an addition, to ensure that no action should be taken in the matter until it had been brought before the Association again, and the amended recommendation was agreed to.

Considerable discussion took place on the question of municipal representation on the Board of Trade Committee on Electricity Supply.

MR. FARADAY PROCTOR (hon. sec.) said he presumed that the Committee on Electrical Trade After the War was prohibited from dealing with municipal trading, and he believed that was one reason why the later Committee on Electricity Supply was formed; the Board had agreed to give them more representation, and he believed the names of three additional members were to be submitted by them. They had also heard that one of their members was to be invited to give evidence.

ALD. PEARSON (hon. solicitor) stated that the Council had adopted a resolution that the President of the Board of Trade should accept the nomination by the I.M.E.A. and the Association of Municipal Corporations of the three new members.

MR. CLOTHIER (St. Anne's) mentioned that the Urban District Councils' Association had been asked to nominate somebody on the Committee.

MR. THOS. ROLES (Bradford) suggested that if the Board of Trade refused to accept their decision on representation, they should consider whether evidence should be given before the Committee.

COUNCILLOR WALKER (Manchester) pointed out that originally it was desired to have witnesses, now a witness, and the Committee would decide the points on which evidence was wanted. He thought this was suspicious, and was prepared to consider the previous speaker's suggestion.

ALD. PEARSON (hon. solicitor) suggested that the Council's resolution be passed, and that a further resolution could be put to the meeting in regard to the representation of the U.D. Councils' Association, but after further remarks by ALD. SMITH (Barrow), who urged that two of the representatives should be engineers, and MR. FARADAY PROCTOR, who pointed out that the Association of Municipal Corporations was putting forward evidence from three localities of large, medium and small population, an amendment was agreed to that the Association of U.D. Councils be included in the resolution.

MR. THOS. ROLES (Bradford) urged that a definite policy should be subscribed to by the I.M.E.A., this being a matter of great importance at the present time, and, after a brief discussion, a resolution instructing the Council to formulate such a policy was passed.

MR. PURSE raised the question of plant extensions by municipalities being refused by the authorities, while power companies appeared to be favoured in that matter, and suggested that the Council should obtain full particulars as to sanctions given and refused to municipal authorities.

MR. FARADAY PROCTOR agreed that rumours had reached them, and that the Council would take action, if facts were submitted to it.

The proposed revision of the Articles of Association, with a view to giving the smaller undertakings more representation, was agreed to after a short discussion with a view to obtaining a representative of an Urban District Council on the Council, an amendment to this effect being lost.

The result of the ballot for officers and Council for 1917-1918 was as follows:—

President.—S. J. Watson (Bury).

Vice-Presidents.—F. Ayton (Ipswich) and Thomas Roles (Bradford).

Past Presidents.—H. Richardson (Dundee), A. C. Cramb (Croydon), and F. M. Long (Norwich).

Council.—New members elected are Messrs. J. A. Robertson (Salford), S. E. Fedden (Sheffield), W. T. Kerr (Hereford), and Aldermen Robinson and Jeffrey; the members of Council remaining in office are Messrs. Britton (Chester), Lackie (Glasgow), Pearce (Manchester), Councillor Barge (Poplar), Alderman West (Coventry), Messrs. Allen (Wolverhampton), Bowden (Poplar), Christie (Brighton), Councillor Sinclair (Swansea), and Alderman Walker (Manchester).

Messrs. Edgcome (Kingston-on-Thames), Alderman Pearson (Bristol), and H. Faraday Proctor (Bristol), were respectively re-elected as hon. treasurer, solicitor, and secretary.

The decision as to the locality of the next annual meeting was left in the hands of the new president.

TWENTY-SECOND ANNUAL REPORT (*abstract*).

After allowing for resignations, removals, and lapses due to members leaving municipal employment, there is a decrease of two in the total membership, now standing at 374, the decrease being in the Associates' class.

Model General Conditions of Contract.—At the last annual general meeting of the Association, it was pointed out that for two years previously the Council of the Association had been in negotiation with the Council of the Association of Municipal Corporations on what were then known as the "Beama" Clauses of the Institution Model General Conditions. As no report was received from the Association of Municipal Corporations on the subject, and as that Association did not respond to the repeated applications of the I.M.E.A. Council to complete their considera-

tion of the matter, it was suggested by the Council of the I.M.E.A. at the annual general meeting held last June that the resolution of the annual general meeting of 1913 should be rescinded and the conditions provisionally adopted.

Further recent inquiries by the I.M.E.A. have resulted in a reply from the Association of Municipal Corporations admitting that the subject is in a position that cannot be regarded as altogether satisfactory.

The present deadlock can only be removed by the generel meeting rescinding the resolution of 1913, and so enabling the Council of the Association to move in the matter independently.

The Council therefore recommend to the general meeting that the resolution referred to be rescinded, and the matter left in the hands of the Council.

Supply of Electricity Bill.—Immediately after the business meetings last June, a joint meeting of representatives of the Council of the Association and of the Association of Electric Power Companies was held, and it was decided to form a Joint Committee to deal with the Supply of Electricity Bill now in draft, and to invite the I.M.E.A. to appoint three representatives in addition to Mr. H. Faraday Proctor, who had been appointed joint honorary secretary of the Committee with Mr. de Turckheim. Mr. F. M. Long, Alderman Walker, and Mr. J. W. Beauchamp were appointed to represent the Association.

As the outcome of the work of the Joint Committee, several new clauses have been embodied in the Bill. These new clauses deal with the granting of wayleaves over, under, or through private property, the construction of lines over ground, the re-drafting of the clause dealing with the giving of partial supply in certain cases (stand-by), the supply to districts where there are no authorised undertakers, obligation of undertakers to furnish a supply, methods of charging, charging and maintenance of electric vehicles, &c., &c.

The various clauses in the Bill were gone through, and evidence in support of the same was given before the Board of Trade Committee on Electrical Trade after the war.

Linking-Up.—On the same day at a similar meeting, the I.M.E.A. was invited to appoint five representatives on a Joint Committee in addition to Mr. H. Faraday Proctor, who was appointed joint honorary secretary with Mr. de Turckheim. The I.M.E.A. representatives are Messrs. T. Roles, S. L. Pearce, R. A. Chattock, W. W. Lackie, and J. H. Bowden.

Several meetings of the Joint Linking-up Committee have been held, and local Committees have been appointed in various districts throughout the country, all of whom have had meetings and are getting out statistics and other information, and in some few instances considerable progress in the matter of linking-up has actually been made.

Eastbourne and the Board of Trade.—In view of the fact that the recommendations of the Officer of the Board of Trade were not adopted by the Board Trade, and bearing in mind that the Electrical Adviser to the Board of Trade is retiring from office in June, 1917, and that therefore it was difficult to take up the question of detail with him, further consideration of this matter has been deferred.

Summer Time Act, 1916.—At the request of the Home Office Committee appointed to inquire into the working of the Summer Time Act, 1916, and its renewal in 1917 and subsequent years, the I.M.E.A. circulated a *questionnaire* on the subject, and the honorary secretary, Mr. H. Faraday Proctor, and other members, gave evidence before the Committee.

Reserved Occupations.—A considerable amount of correspondence has taken place with the Reserved Occupations Committee; and representatives of your Council, acting in conjunction with the Institution of Electrical Engineers and the Incorporated Association of Electric Power Companies, waited as a deputation upon the Reserved Occupations Committee with a view to pointing out the necessity of reserving to electrical undertakers a sufficiency of of qualified employés to carry on the undertakings in a reliable manner for the maintenance of munition supplies, &c.

Training of Disabled Sailors and Soldiers.—At the invitation of the Institution of Electrical Engineers, the I.M.E.A. nominated Mr. J. W. Beauchamp to serve on the Committee formed by the Ministry of Labour to make inquiries into the question of the employment of disabled sailors and soldiers in the electrical industry, and the training necessary for this purpose. Mr. Beauchamp also represents the Association on a similar but distinct Committee formed by the Ministry of Labour.

Engineering Standards Committee.—The Association has received its contribution of £21 to the funds of this Committee, and continues to be represented on many of its Sectional Committees, Sub-Committees, and panels.

Research on Buried Cables.—At the request of the Institution of Electrical Engineers, the Council of the I.M.E.A. issued an appeal to undertakings represented in the Association to support financially the Institution in the work which it was carrying on in this matter.

British Trade after the War.—Following the resolution passed at the last annual general meeting which was communicated to the Prime Minister, the engineering members of the Association were circularised, and the honorary secretary, Mr. Faraday Proctor, attended on several occasions before the Board of Trade Committee on electrical trade after the war. The president, Mr. F. M. Long and Mr. Thomas Roles, of Bradford, also gave evidence. The report of the Committee has not yet been published.

As previously mentioned in this report, evidence was given at great length in support of the various clauses of the Supply of Electricity Bill, and also in connection with various recommendations put forward as to the constitution, duties, and limitations of Government departments, concerned in the regulation of the actions of electrical undertakers, and the supply of electricity generally.

Alleged Preferential Charging at Hackney.—The members will be aware that the Gas Light and Coke Co. are bringing an action against the Hackney Borough Council on a case of alleged preferential charging. The Council considered that Hackney had a very good case, and strongly recommended the members of the I.M.E.A. to contribute towards their defence.

Articles of Association.—The Council have given very careful attention to the question of the revision of the Articles, providing for postal ballot, and also for an altered constitution of the Council. The effect of the alterations is that while the number of the Council, viz., 25 members, is not increased, there will be only one vice-president and only one past president, thus adding three to the number of ordinary engineer members of the Council, without increasing the total number, or altering the present proportion between engineer and Committee members. As regards the question of the definite representation of all sizes of undertakings, the Council are of opinion that this will be better dealt with by a resolution of a general meeting. The resolution is in the following form:—

"That whereas by Article 28 there shall be 18 ordinary members of Council, 12 being engineer members of the Association, and six representing municipalities, and, by Article 29*a*, four engineer members of the Council and two municipal representatives of the Council shall retire annually, it is resolved that annual elections be so arranged that there shall, during each year, be nine engineer members on the Council from undertakings owned by local authorities where the population of the area of supply exceeds 50,000; and three engineer members from undertakings owned by local authorities where such population does not exceed 50,000."

The Electric Vehicle Committee.—During the past year the scope of the Electric Vehicle Committee has been widened, as is indicated by its new title, "The Electric Vehicle Committee of Great Britain. Formed under the auspices of the I.M.E.A."

Honorary Treasurer's Report.—The total expenditure is £545, or £50 more than last year. The income from subscriptions is normal, and the revenue from proceedings £154, an increase of £50. The receipts from members' and delegates' fees are normal, and the total income is £554, as against £506, leaving a balance of £10 as surplus for the year.

The total surplus of assets over liabilities is £936, so that the Association continues to be financially sound; but there is no margin for expansion, and it is a question whether the subscriptions should not be raised so as to enable the Association to deal with more advantage with questions affecting the interests of that section of the industry represented by the Association.

Agricultural Development.—During the year a Committee on the Development of Electricity in Agriculture has been formed to deal with this subject, with power to add to their number, both from the ranks of the Association and from other sources, and to present a report in due course on the matter generally for future action.

It is proposed to invite representatives of Government Departments, Agricultural Societies, and Electrical Associations to serve on the Committee, so as to co-ordinate co-operative effort in carrying out the objects of the Committee.

Individual Interest in Municipal Enterprise.

Abstract of paper by J. HORACE BOWDEN, *Poplar.*

To successfully control a municipal undertaking, concentration of thought during an undisturbed period of a number of years is necessary on the part of those responsible for the management, and in order to secure this, not only should the municipality pay sufficient remuneration to prevent distraction from undivided attention by their official staff, which striving after increased remuneration engenders, but should also offer inducements to the staff whereby the desired results might be attained, to the material benefit of those responsible for their attainment. It is therefore incumbent upon every municipality to give consideration to any scheme which would induce the members of each of its trading staffs to concentrate their whole energy on producing certain results, and, in giving consideration to any such scheme, the varied interests connected with the supply should essentially have equal prominence.

The primary interests of the consumer and the ratepayer are linked indissoluably together. Low charges for supply to the consumer produce the asset to the municipality, but the price paid for the supply should be such as to amply provide for the guarantee given by the municipality on the security of the rates. Cheap prices and participation in profits may appear to be diametrically opposed, but it must always be borne in mind that the ultimate result of low charges means that all ratepayers would become consumers, and therefore any apparent injustice by contributing to rates out of profits would eventually disappear.

Consumers' and staff interests are linked, inasmuch as satisfactory working conditions, adequate remuneration, and security of tenure tend to ensure continuity of supply and efficiency of service. Low prices to the consumer and participation in profits by the staff can be made of identical interest by the introduction of proper safeguards to the consumer into any profit-sharing scheme.

The interests of the ratepayers and the staff have everything in common respecting security of guarantee; judicious capital expenditure is the most effective medium of profit production.

The interests of the ratepayers and staff are also common in respect of profit sharing, and the author is of the opinion that the scheme submitted in this paper will ensure the best results to the ratepayer, and at the same time secure for an undertaking a sound financial footing.

It is of paramount importance that every municipal electricity undertaking should be placed upon a sound financial basis in priority to any other consideration.

For a number of years prior to the introduction of a profit-sharing scheme at Poplar, and before any contribution whatever was made to the rates, a drastic policy of writing down and scrapping obsolete plant was adopted, together with a system of payment out of revenue for all assets for which loans could not be raised for periods of 20 years or over. All existing loans were converted from the annuity or annual instalment to the quarterly instalment system.

To-day the statement of loans outstanding comprises only :—Lands, buildings, mains, and machinery, with £3,500 for services and £750 for accumulators. Both of the latter will be wiped out during the course of the next three years under the scheme adopted. No money for machinery has been borrowed since January, 1914, all new plant having been purchased out of amounts written down in respect of obsolete plant.

All machinery of any description laid down prior to 1905, with the exception of two boilers and the original L.T. switchgear, has been entirely written out of the books of the undertaking. The war has temporarily suspended this financial policy, but the author is convinced in his own mind that it is absolutely correct, and, after the war, will advocate the scrapping of the major portion of the plant laid down between 1905 and 1913, in order to bring the machinery right up to date without increasing the present liability on that account.

In furtherance of this policy, therefore, it was necessary, before considering the disposal of surplus profits, to lay down a schedule of first charges upon surplus profits, as follows, viz. :—

Minor improvements to buildings and plant.
New meters and services.
Wiring, cooking, and heating installations.
Showroom and test room fixtures.
Instruments, office furniture and tools.
Cost of reclaiming disused cable.
Removal and re-erection of machinery.
Sundry expenses connected with capital work and plant.
Lay aside £1,000 per annum over and above requisite amount of redemption for reducing the debt on account of services, instruments, and accumulators.

Working balance at end of each financial year to be made up to 10 per cent. of the total income for that year.

After payment of the foregoing charges on surplus profits, the available balance (if any) in any year is apportioned as follows, viz. :—40 per cent. is placed at the disposal of the Finance Committee of the Council ; 20 per cent. of a sum up to £6,000 available for disposal, and 10 per cent. on available sum over and above £6,000, for division amongst the members of the permanent staff. Remaining balance is placed to the credit of capital machinery account for writing down obsolete plant.

The amount placed at the disposal of the Finance Committee may or may not be utilised for relief of rates, but preference is given to its utilisation for works which would have a beneficial effect upon the rates.

The bonus to staff is apportioned as follows, viz. :—A moiety to the principal officers of the staff, and the other to the junior officers and workmen permanently employed *pro rata* to the normal salaries and wages paid in the year in which the bonus is earned.

The proportion payable to the principal officers is divided as follows, viz. ;—One-half to the chief engineer and manager ; one-fourth to assistant manager ; one-fourth, in equal proportions, to the station and mains engineers and sales manager.

The financial soundness of this scheme must commend itself to all concerned, as, no matter how rapidly an undertaking may develop, the cost of new connections, and all improvements to the existing system, must be taken from revenue before any sum is available for bonus.

On January 6th, 1915, the Poplar Electricity Committee finally approved the scheme on the lines indicated in this paper, subject to a general reduction of 25 per cent. in charges to private lighting consumers. The following results will indicate in some measure whether the scheme has been justified or not :—

Year ending March 31st.	Units sold.	Per cent. of bulk supply at 0·25d.	Average price.	Average cost of coal per ton.	Net profit.
			d.	£ s. d.	£
1913	12,014,794	1·3	1·122	0 14 4½	3,170
1914	16,716,705	16·0	0·971	0 14 2	8,010
1915	16,889,048	8·0	1·043	0 12 5½	14,749
1916	21,505,614	11·9	0·988	0 17 11½	11,815
1917 Estd. ...	23,265,000	14·8	1·06*	1 1 6	11,500

* Increase of 10 per cent. on power charges.

The saving aimed at is not in labour, but on materials used—viz., coal, water, oil, &c. The most important point affecting bonus, however, is the promulgation of business, each man being a potential canvasser of the undertaking.

Increase in business means the employment of a larger number of hands for various extensions, services, and wiring installations, a greater number of men being required for these purposes than merely for attention to generating plant.

Allocation of Bonus to Staff.—The proportions payable, as set out in the Poplar scheme, may not appeal to every municipality, and, as an alternative, the distribution may be made wholly as a percentage of annual salary or wages. To illustrate the difference between the two systems, the author submits the payments made by the Poplar Borough Council as a result of last year's trading—viz., 1915-16 :—

Amount available for distribution, £1,262 3s. 10d.

Principal officers ... £631 2 0 or 36·6 per cent. of salaries.

Junior officers and workmen ... ... £631 1 10 or 6·09 per cent. of salaries or wages.

Had the alternative proposition been in force, the whole of the staff would have received 10·43 per cent. of their annual salary or wage.

When the facts are taken into consideration that private lighting supply was reduced by 25 per cent., that coal cost 3s. 9½d. per ton more than in the year prior to the introduction of the profit-sharing scheme, and that a full year of war conditions was experienced, carrying with it war bonuses, payments to dependents of those on Active Service, and a general all-round rise in price of materials, yet the net profit was increased by £3,800, it is fairly obvious that remuneration under the alternative scheme to those officers primarily responsible for the results would have been inadequate.

The logic underlying the Poplar system is that, by application, economies can be effected in both the generating and distributing departments, and an energetic and properly-controlled sales department can influence the revenue of an undertaking to a considerable extent.

Judicious management brought to bear on each of these departments produces results nearest approaching the ideal, therefore it is reasonable to allow the assistant manager a share equal to each of the shares allotted to the heads of departments, whose efforts extend to their departments only.

As the general manager is the responsible officer over all departments, upon whose judgment the decision in all matters must finally rest, it appears an equitable arrangement to allot double the amount received by his chief assistant, which is usually the proportionate difference in salary.

Investment of Profits on behalf of the Staff.—It is a debatable point whether compulsory investment in an undertaking should be insisted upon, and much can be advocated for and against compulsion.

In most well-ordered municipalities, superannuation and pension funds have been established, and sick benefits have been offered to the staff, which are supported by compulsory contributions by the staff and the municipality, therefore the necessity for compulsory thrift does not appear to be nearly so great in municipal undertakings as in private enterprise. On the other hand, it may be anticipated that, by investing savings in the business in which he is employed, a greater interest in the working of the business would be engendered, and it would appear that every facility for investment should be given as a means to that end. Furthermore, pension schemes, as a rule, provide for the employé only in old age, but not for his family, and should he die immediately after his retirement, his family gain nothing therefrom.

In the Poplar profit-sharing scheme, provision is made for a working balance of not less than 10 per cent. of the annual income of the undertaking, and as no provision has been made for working capital in any of the Electric Lighting Acts, it is reasonable to assume that no legal objection would be raised to the municipality accepting deposits from the staff up to the stated amount, and interest allowed thereon not exceeding the rate at which money could be obtained from the usual sources. It may also have been noted that the Poplar scheme allows for a 20 per cent. bonus on available balances up to £6,000 per annum, and 10 per cent. on any sum available over £6,000.

A line of demarcation between voluntary and compulsory investment suggests itself, and the author submits that the benefits of any profit-sharing scheme would be enhanced if the amount accruing at the rate of 20 per cent. were to be handed over to the staff to be invested in the undertaking or otherwise at the option of the employé, and that accruing at the rate of 10 per cent. be compulsorily invested in the undertaking, all on terms suggested.

There can be no doubt that current events indicate that in the near future labour will command a much greater share in the profits of all enterprises, whether national, municipal, co-operative, or private, and the greatest evil to be feared from this much-to-be-desired state of affairs is the misapplication of the prospective enhanced income of the worker.

Assuming that the opinion of the author is correct, it would be necessary for the employé to enter into an agreement with the employer that the sum invested should not be withdrawn except after a period of not more than 12 months, on retirement or at death, in order to guard against the impulse of the improvident to withdraw at any time merely for the purpose of squandering any accumulation of profit and interest. The Council would, of course, exercise its discretion in paying out immediately in cases of manifest necessity on the part of employés.

Sliding Scale to Adjust Bonus with Charges for Supply.—Seeing that the work of the undertaking was carried out under more arduous conditions than appertaining in previous years, the author has been forced to the conclusion that no profit-sharing scheme would be complete without a sliding scale to adjust profit-

sharing applicable to increase as well as decrease in charges for supply.

The "point-five" system of charging (which originated at Poplar) is admirably adapted for working in conjunction with a profit-sharing scheme. As most of the members are aware, this system comprises an annual charge based upon the probable demand of each consumer, plus 0·5d. for each unit used. The author proposes to recommend that this system shall become permanent, and when it becomes necessary to increase charges, a pre-determined percentage would be added to each account, but if it is found, after balancing the books for any year, that a rebate of 2½ per cent., or multiples of 2½ per cent. can be allowed to consumers, the determined amount shall be allowed on the following year's accounts.

The advertising effect of the rebate system in connection with small consumers must appeal to every electricity supply manager.

The present bonus scheme would hold good under the normal point five system, and the following scale applied for advanced prices :—

Increase in charges. Per cent.	Per cent. of bonus up to £6,000 available surplus.	Per cent. of bonus over £6,000 available surplus.
5	18	9
10	16	8
15	14	7
20	12	6
25	10	5
30	8	4
35	6	3
40	4	2
45	2	1
50	Nil	Nil

A sliding scale applicable to decrease in charges appears to be a much more difficult problem, firstly, because the cost of production is likely to steadily decrease for many years to come, and finality in this respect is difficult to anticipate; secondly, a financial policy carried out on similar lines to that in vogue at Poplar would eventually wipe out machinery entirely from the loans account, thus reducing capital charges to a large extent; and thirdly, because the interests of the consumer, the ratepayer, and staff should receive equal consideration.

After mature deliberation, the author has arrived at the following conclusions, viz. :—

"That a minimum available sum for profit-sharing, contribution to rates, and reserve for displaced machinery should be fixed, which in the case of Poplar the author has earmarked at £6,000. That is to say, if the amount for disposal reaches £6,000, the following division would be made, viz. :—

Finance Committee, 40 per cent.	£2,400
Bonus, 20 per cent.	1,200
Reserve for displaced plant	2,400
	£6,000

In the event of a greater sum being available, which would allow of a rebate of 2½ per cent. or multiples of 2½ per cent., then the minimum amount for disposal should be increased by £1,000 for every 2½ per cent. granted as rebate. Any balance after allowing for the minimum sum according to scale, to be carried forward for the purpose of allowing further rebates. Upon this system the following sliding scale would apply, viz. :—

If rebate granted at	Minimum sum for disposal, plus necessary amount of rebate.	If rebate granted at	Minimum sum for disposal, plus necessary amount of rebate.
Per cent.	£	Per cent.	£
2½	7,000	27½	17,000
5	8,000	30	18,000
7½	9,000	32½	19,000
10	10,000	35	20,000
12½	11,000	37½	21,000
15	12,000	40	22,000
17½	13,000	42½	23,000
20	14,000	45	24,000
22½	15,000	47½	25,000
25	16,000	50	26,000

Discussion.

Mr. Littler (West Ham), in opening the discussion, said he agreed to the general principle indicated by the author; a direct interest was a great incentive for extracting the best from a man. He rather doubted whether security of tenure was an altogether good thing; it might be a handicap in both municipal and Government work. Labour was secure in its position and a bonus did not carry with it the same risk as in the case of the higher staff. He doubted whether, with the proposed allocation of surplus, the engineer might not find his remuneration seriously reduced, due to the effect of his own industry, in increasing assessments. He could not agree with the arbitrary handing over of 40 per cent. of the surplus to the Finance Committee; the ratepayers had a right to some return, but did they not get a sufficient return in the benefit conferred on the town by a sound undertaking? He was afraid that labour would be opposed to the idea; the profit-sharing schemes in the London gasworks had not given the expected results. The suggested division of the bonus might also not be acceptable to labour, and any interference with its disposal would be resented. The bonus must be over and above the fair remuneration of labour.

Mr. Mundy (Secretary, Co-partnership Association) disagreed with the suggestion that profit-sharing had been a failure in the gas industry; despite the war and more attractive labour conditions, the profit-sharers had fallen off very little in number, and Dr. Carpenter, of the South Metropolitan Gas Co., had emphasised the great benefit obtained *during* the war from the co-partnership scheme, which had been in existence 25 years, and was a good example. He agreed that the Trade Unions were antagonistic, but in works where it was in existence it was welcomed. The bonus was a dividend on labour—a share in the profit—and he contended that it should remain in the form of capital, and thus have a permanent influence, whereas a cash bonus was spent and forgotten.

Mr. C. H. Wordingham (president Inst. E.E.) said, personally, he had always found municipal engineers keen on their work, but the bonus might make them more careful in the case of doubtful experiments with tariffs. He was afraid that if the State stepped in it would mean that the State would be paramount, and its influence was all in the direction of private enterprise. Profit sharing appealed strongly to him, but the workman did look on it with suspicion, and would certainly resent the bonus being invested for him; he doubted whether compulsion was advisable in any way.

Alderman Barge (Poplar) said this was the third year of operation of their bonus system; the bonus was not regarded as wages—it was an addition, and was favoured by the men. The division of the bonus was a knotty problem, but he thought the management deserved special consideration in the matter.

Alderman Walker (Manchester) said the proposal was a good one if it promoted efficiency, but he thought the author might be on doubtful ground in proposing a scheme which, by increasing prices, allowed of a bigger contribution to the rates. Personally, he believed in contributing to the rates a definite percentage on the outstanding debt, as at Manchester. The bonus would not remove a man's desire to get to the top of his profession, and, personally, he would not care to eliminate that desire. If the proposal were generally adopted the question would arise as to what extent labour would demand a hand in the management of the funds and eventually of the department.

Alderman Thompson (Wolverhampton) said the idea behind the scheme was to make the workmen into capitalists. He had had some years' experience of a profit-sharing scheme in his own works, and found it a success. They practically allotted a man capital equal to his year's earnings, and guaranteed him certain interest on it; last year the interest was 12½ per cent. If anything, the trouble was that the men wanted to increase their holdings. When the war came, a number of men agreed to 10 per cent. of their earnings being deducted and invested in a thrift fund, and it was intended eventually to invest this in the business and give the men a representative for their capital on the Board.

Mr. L. L. Robinson (Hackney) said there were other troubles in municipal work beside those hinted at by the author; he commented on the lack of cohesion of municipal authorities, and said he felt that the time would come when existing undertakings would have to be taken over by a number of large statutory companies under Government control. There was a good deal of justice in the higher proportion suggested for the staff bonus, but it was likely to result in jealousy, also if those who helped most towards efficiency were to receive most bonus, then the boiler house would get a larger proportion. They had a bonus scheme in view for the Hackney undertaking, but it was not yet quite matured.

Mr. T. Hall (Burton-on-Trent) explained the bonus system in operation for three years in his town, which was based on the saving in works costs below 1d. per unit. This scheme had worked well, but he felt that the bonus should only be applicable to items which could be controlled by the worker, and not on rates and taxes. He confirmed the author's view that the staff became direct canvassers, naively remarking that there was hardly a public house which had not electric light. There was no enthusiasm for the investment of the bonus amongst the men, and he understood that a municipal authority had no power to invest money in this way.

Mr. Bowden, in replying, agreed that security of tenure had a two-sided effect, but he claimed that the bonus system would do away with the objectionable side. The effect of the assessment was not quite such as might be thought, at least in the London area. The bonus scheme would not deter a man from moving, but he would give the matter more consideration if he had to relinquish some other benefit. When the Poplar scheme was started, they could find no other undertaking with a similar scheme, though partial schemes had been in existence for some years. He believed that Parliamentary powers were under consideration to allow of investing employés' money in municipal concerns.

The 1886 Company: More Resolutions.—A note from Moscow says that a conference held there to consider the problem of the 1886 Company declared decisively against the formation of a new share company with the participation of representatives of the town on the board of the company. The conference once more affirmed that the company should be liquidated in due course. The property should be valued on the basis of prices existing before the war; whilst the interests of the shareholders of Swiss nationality should be respected.

A note in the *Novoye Vremya* says that at a meeting of town councillors on the liquidation of the 1886 Company and of the Peredatch (Electrical Transmission Co.) a mixed board, consisting of representatives of the town and of shareholders which would keep the German element concealed, was considered undesirable. Both concerns should be liquidated.

ELECTRIC STEEL.

(*Concluded from page 672.*)

A VERY elaborate paper on the "Electric Characteristics of Electric Furnaces" was presented by MR. A. A. MEYER, of the Detroit Edison Co., giving the results of an electrical investigation of a Heroult and of a Grönwall electric steel furnace, covering their construction, operation, load fluctuations, power factors, unbalancing effects on the three-phase system, and wave distortion as determined by the oscillograph. The oscillograph data were studied closely, to draw from them deductions as to the self-induction of the furnace and connections. The effect of these considerations on the accuracy of the customer's watt-hour meters was also discussed.

MR. C. H. VOM BAUR, with Messrs. Hamilton and Hansell, read a paper giving further information on the Rennerfelt electric furnace, supplementary to a former paper. The principal improvements, since made, were as follows:—

1. The furnace hearth is now circular, with one set of electrodes, and oval shaped with two sets.

2. The side electrodes are adjustable in a vertical plane, allowing them to dip toward the bath.

3. The available power, or instantaneous available heat, has been largely increased.

The operating results obtained by making these three changes had not only kept up the quality of the steel, but the cost had been reduced materially.

With a circular hearth and the flame in the centre, the heat distribution was equal at the slag line; there were, consequently, no cold corners, obviating overheating when melting, which was so detrimental to both side-walls and roof. The side-walls, slag-line, and roof, especially the latter, now dome-shaped, were easier to repair. Often, only the centre portion of the roof bricks needed replacing, the other roof bricks lasting twice as long.

The second feature, viz., tipping the side electrodes down from a horizontal position, had several advantages. When smaller charges than normal were made, the most efficient height over the metal, when melted, could be had. During melting, the electrodes at the start, whether for partial or full heats, were usually only an inch or so (2·5 cm.) over the bath. As the charge melted, the electrodes were continually lowered, thus keeping the flame about 2½ to 3 in. (6·2 to 7·5 cm.) over the bath. Bringing the flame closer to the bath accomplished two things: the melted steel more readily absorbed the heat, and the large flame being farther away from the roof, the life of the roof was lengthened. This was proved by the shorter time to make a heat from a cold charge, and by a longer life of the roof.

The possibility of tilting the electrodes up and down helped when slagging off, and lessened the breakage of electrodes.

The flame being nearer the bath, and with the same potential, had a tendency to circulate the slag faster. This could easily be observed, and was of the greatest importance. A more shallow bath facilitated the refining, as the metal came in contact with this slag on a larger surface.

The flame itself, depending on the size and electric power of the furnace, seemed to make a circular patch on the thinned slag directly beneath the flame about 8 or 10 in. (20 to 25 cm.) in diameter, and then mushroomed out. The hotter the furnace, the better the conductivity of the gases and the greater the spreading of the flame. In a two-flame furnace, this flame at times seemed to spread over the entire bath. This appearance was, no doubt, due to incandescent gas. The hearth was made more shallow, and thus the rammed-in bottom, coming up at the sides, made the sides less steep. This shallow bath shortened the time of melting down, and the lining was less affected at the slag line.

The regulation of the heat applied to the bath was made easier by the variable position of the flame above it, and it also lessened the danger of overheating, which was apt to become so detrimental with an acid bottom. The almost invariably clean steel produced, with the absence of inclusions, was obtained by careful handling, yet the ease of avoiding overheating was of first importance. Metallurgists who had operated the Rennerfelt furnace had particularly noted this point, and the avoidance of worry which thus ensued.

Having the electrode tips never more than 3 in. (7·5 cm.) above the bath, had materially reduced the time of melting (so far no Rennerfelt furnace in the United States was using fluid charges). With basic bottom the dephosphorising time had remained unchanged, and the desulphurising period, with the aid of calcium carbide slags, had been reduced. When refining and reducing sulphur with a built-up slag from ferro-silicon and lime, as used in the induction furnace, this was accomplished with good effect.

With furnaces having 300 KW. power per ton of output, heats had been made on basic bottoms, taking off one slag in 2½ hours with 670 KW.-hours per ton when operating continuously. With acid bottoms and 200 KW. power per ton of output, taking off one slag, good steel and full heats had come off in 3¼ hours, with 635 KW.-hours per ton.

The electrode consumption was less than 6 lb. (3 kg.) per ton of steel made, operating continuously. Even with the present excessively high cost of refractories, their cost had been reduced in the smaller furnace of one ton from $2·91 per ton of steel made to less than $0·80 per ton. Roofs were lasting over 100 heats, and approximated the longer life made in Europe with better refractories. With a higher power input, the heats were shortened, due to the smaller melting period (the heat being considerably reduced during the refining time), thus roofs were lasting more heats than formerly, though the actual time was not much changed. Side-walls of brick outlasted two or more roofs, while the bottom lasted a year or two.

The third change, to higher powered furnaces, besides lowering the cost per ton in every way, steadied the consumption of electricity, which had already been very constant. For instance, a 3-ton furnace operating with 600 KW., with hand-regulated electrodes, would reduce in four or five minutes to about 550 KW. without any fluctuation (except during the first part of the melting period) and without touching the electrode regulating mechanism. With smaller furnaces the steadiness was not so marked, whereas with still larger ones, the effect was but little improved. The power factor was about 90 per cent., with 60 cycles. All sudden strains on the power supply were avoided. The arc voltage had been raised, and was now 110 to 120 volts.

In general, too much stress could not be laid on the various small details—such as tight doors and tight openings around the electrode cooling boxes. With the latter, besides a small clearance between the cooling box and the electrodes, asbestos washers helped materially.

CORRESPONDENCE.

Letters received by us after 5 P.M. ON TUESDAY *cannot appear until the following week. Correspondents should forward their communications at the earliest possible moment. No letter can be published unless we have the writer's name and address in our possession.*

"Cross-talk" and "Secrecy."

There has been a certain amount of confusion in the past with regard to the terms "Cross-talk," "Overhearing," and "Secrecy" as applied to telephone systems. With a view to establishing as far as possible a clear understanding as to what is implied by the respective terms, and to frame definitions in such a manner that, while technically correct, they will convey a clear distinction to non-technical purchasers and installers of telephone systems, this Association has adopted the following definitions, which have also been submitted to, and approved by, the Council of the Institution of Electrical Engineers:—

"Cross-talk" in telephone systems is the unintentional overhearing between one circuit and another not due to any such metallic connection as arises from accident or is effected by a user or third party. In practice, the "cross-talk" may be due to disturbances arising from electromagnetic or electrostatic induction, to leakage, or to insufficient conductance in a common portion of circuits.

"Secrecy" in telephone systems is secured by an arrangement of circuits making it impossible for a third party by any normal use of the system to cut in and listen to the conversation taking place between two users—at any rate, without the knowledge of the parties conversing.

The term "secrecy" must not be confused with freedom from "cross-talk."

For **The Telephone Manufacturers' Association,**
E. A. BROWNE, *Secretary.*

London, *June 25th*, 1917.

Industrial Fatigue and Maximum Output.

With reference to the leading article on the conditions of labour in your issue of June 15th, in which you refer to the various causes of labour unrest, apparently no mention is made of the fundamental cause of labour unrest.

Even if all the causes mentioned in Prof. Henry J. Spooner's pamphlet were removed, the workman would not be satisfied, and there is only one way in which he will ever be satisfied, and that is by receiving a share of the profits or wealth which he helps to create. Providing the workman has a share in the prosperity of the firm, he will realise that any improvements in efficiency benefit him also. Deny him this, and he is up against his employer all the time.

General profit sharing is, however, only possible if the whole productive industry is placed on a profit-making basis, and this can only be assured by protection, bonus, or the prevention of unfair competition.

There will be no proper settlement of the labour question until those in power recognise that prosperity depends primarily on successful production, and that the producer should be the master, instead of the servant of the middleman.

Producer.

[It is generally recognised by all students of industrial problems that contented labour cannot be secured without reasonable wages, also that higher wages cannot be paid unless increased efficiency and productivity render such practicable. The leaderette referred to dealt mainly with the causes of fatigue, and of course did not cover the whole of the author's comments. We advised those interested to read the pamphlet for themselves. In justice to Prof. Spooner it should be stated that in a brief section on "Psychology and Fatigue," he shows that fatigue may be due to anything that affects the nervous system, including worry, and of that inadequate wages may well be a cause. He shows too how re-classification of trades would secure higher wages and low production costs. The author also refers to the effect of interest or incentive on output in increasing a man's capacity—"it may be a bonus, or a share in the profits as a co-partner, that quite naturally spurs the worker to

almost unconsciously increase his output." There is no fear of this aspect of labour problems being overlooked; we have dealt with it exhaustively in these pages. Indeed, in our leaderette we quoted Mr. Clynes's foreword to the effect that in order to secure increased production, the worker or producer asked for a fair share of the increased reward.—EDS. ELEC. REV.]

Salaries in the Electrical Industries.

I should like to draw your attention to a fact not particularly noticed. The salaries of electrical men in this country do not share the increases allotted to other trades. An advertisement is now appearing in the *Daily Telegraph* for sewing M/C mechanic, £5 a week; motor-car mechanic, £6 a week; driver, £5, whereas for a qualified shift engineer advertisers offer the miserable amount of 50s.—week by week—telephone faultsman, fitter and repairer, £2; foreman wireman, with A.C. experience, £3; whilst a good electrician, training as a kinematograph operator, can obtain easily £4. What are the Unions doing? Why are men here less skilful—has not the miserable pay something to do with it? Swansea is paying £3, £4, £5 and £6 for good men, but I fail to see any in your columns.

This does not apply to the writer, for I can get my price without being a shift engineer or foreman at 50s.

Bad Pay—Bad Results.

NEW ELECTRICAL DEVICES, FITTINGS, AND PLANT.

Readers are invited to submit particulars of new or improved devices and apparatus, which will be published if considered of sufficient interest.

Henley's Terminal Boxes.

A handsome catalogue, recently issued by MESSRS. W. T. HENLEY'S TELEGRAPH WORKS CO., LTD., of Blomfield Street, E.C. 2, gave full particulars regarding a very wide range of terminal boxes to suit all conditions. One of these, a small inverted box for outdoor use, is illustrated herewith (fig. 1); it is suitable for three or four-core cables up to 0·05 sq. in. (32 mm.²), and is fitted with Henley's patent lead cone gland, or a brass wiping gland, as desired. In

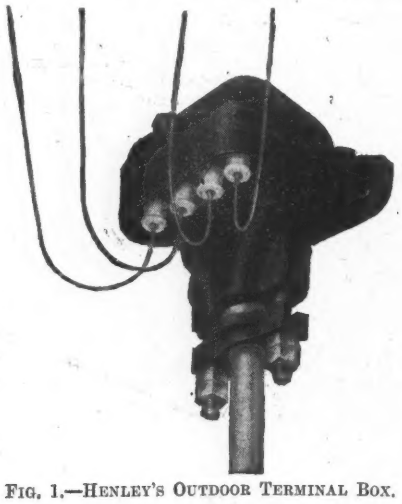

FIG. 1.—HENLEY'S OUTDOOR TERMINAL BOX.

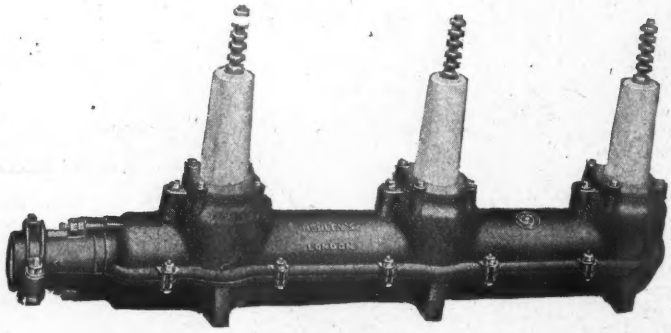

FIG. 2.—RIGHT-ANGLE TERMINAL BOX.

addition to those included in the list, the makers have standardised some other patterns, one of which is shown in fig. 2. This is a right-angle box for a three-core cable at 11,000 volts (tested to 35,000 volts), each core being ·3 sq. in. (194 mm.²); the length overall is 52¼ in. (1,327 mm.), and the weight 168 lb. (76 kg.).

Another box not included in the list has been specially designed for three-core split-conductor work (fig. 3), and withstood a test of 100,000 volts between conductors and between conductors and earth, for 15 minutes, and 15,000 volts between splits for 5 minutes; the actual working pressure is 20,000 volts. Full particulars of these new boxes can be obtained from the makers.

A Large Ignition Magneto.

THE BRITISH LIGHTING AND IGNITION CO., LTD., which has lately been formed under the auspices of Messrs. Vickers, Ltd., to acquire and carry on the British business of the Bosch Co., has recently turned out what is claimed to be the largest ignition magneto so far manufactured. The apparatus was designed and constructed for use on a 1,500—2,000-H.P. stationary engine, having 12 cylinders of approximately 21-in. bore by 24-in. stroke; the engine is of the tandem type, with trunk pistons, the speed ranging from 500 to 2,000 R.P.M., according to duty, although it is capable of being slowed down to 30 R.P.M. Altogether four of the new magnetos, which are throughout of British manufacture, are fitted to the engine, they being arranged in pairs, two to each group of six cylinders, and set shaft to shaft, one magneto thus rotating clockwise and the other anti-clockwise. Each cylinder is provided with two sparking plugs, which are about 14 in. in length overall, both the plugs being arranged to fire simultaneously. The weight of each magneto is 62¼ lb., the coil alone weighing 11 lb. The latter measures 14½ in. in length, and the secondary winding, which is built up in four sections, is stated to carry over 4½ miles of wire. A special feature of the magneto is the switch by means of which the coil can be used in conjunction with the magneto, of which it forms an integral part, or with an ordinary accumulator which may be introduced to facilitate the starting of the engine. We understand that the new magneto has been subjected to exhaustive tests, and that as a result of the satisfactory working, the B.L.I.C. undertaking has already received a number of orders for magnetos for ignition purposes on high-powered, heavy-duty, slow-running, internal-combustion engines.

WAR ITEMS.

Electrical Training of Disabled Soldiers.—Rochdale Electricity Committee has received a letter from a Trade Union objecting to the training of wounded soldiers for switchroom work, but the Committee has taken no action in the matter.

Carels Frères Bombed.—German munition works established in Carels Frères factory at Ghent are said to have been totally destroyed after a very lively air attack.—*Times.*

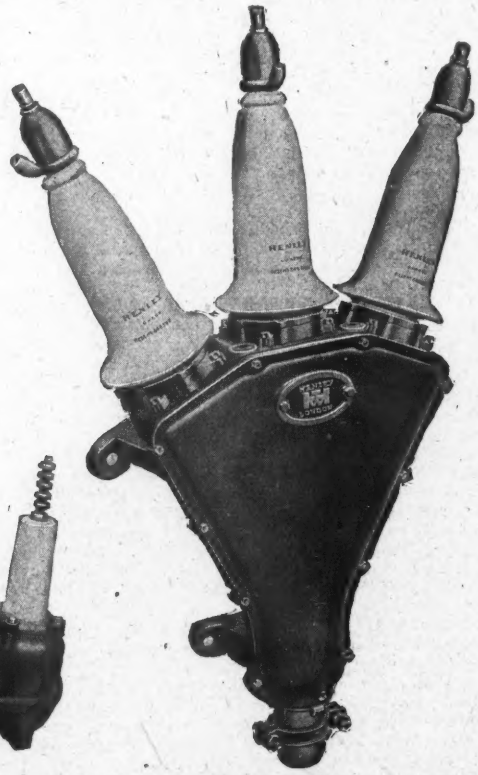

FIG. 3.—SPLIT-CONDUCTOR TERMINAL BOX, FOR 20,000 VOLTS.

Trading with the Enemy.—The "London Gazette" for June 22nd contains amplified and revised lists of bodies and persons in the following countries with whom trading is prohibited:—Argentina, Bolivia, Brazil, Chile, Greece, Netherlands, Norway, Spain, Sweden, &c.

The Professors of Ghent.—"Les Nouvelles," of Maastricht, states that the German authorities recently deposited £120,000 in a Swiss bank in order to secure an annual income to the professors of Ghent University in the event of their being expelled from Belgium after the war. The sum was obtained from funds of the Belgian Ministry of Sciences and Arts.—*Times.*

Profits on Government Contracts.—A new Defence of the Realm Regulation empowers the Admiralty, Army Council, and the Ministry of Munitions to vary the terms of any subcontract for Government work where it appears to them that the rate of profit is unreasonable or excessive by the substitution of such terms as they may think fair and reasonable.

Electricity Works and Air Raid Warnings.—In reply to a Parliamentary question, Sir G. Cave said it had been customary to give notice to the Metropolitan electricity works of expected air raids between an hour after sunset and an hour before sunrise. Conditions to-day, however, were different, but if power undertakings desired the official air raid warnings communicated to their works by day their applications would be considered.

To be Wound Up.—The Board of Trade has ordered the winding up of the following under the Trading with the Enemy Amendment Act, 1916:—

Fortuna Machine Co., Ltd., Deacon Street, Leicester, manufacturers of machinery and machine tools. Controller: C. J. Pain, 18, Low Pavement, Nottingham.

W. P. Theerman & Co., Ltd., 283, Oxford Road, Chorlton-on-Medlock, Manchester, electrical engineers. Controller: W. Eaves, 15, Fountain Street, Manchester.

Air Raids and Tramcar Lighting.—Writing to West Ham Corporation, the Commissioner of Police states that under present conditions it is considered possible to allow tramcars to resume normal lighting inside, provided that the lighting circuits are so arranged that the whole, except the ordinary traffic lights, can be switched off when "air raid action" is announced, and that if one or more interior lights are kept on to complete the circuit, they must be continually kept shrouded or screened so that no light is visible from outside during the period of air raid warnings.

Wages of Discharged Soldiers.—The Electrical Trades Union has opened a special branch for electric power station and supply men, who have hitherto belonged to a variety of Unions, or to none. Branches have been formed in Manchester and Liverpool, as well as in other leading centres, and a standard scale of wages and conditions has been drawn up. The Union is entering a strong protest against the action of some Corporations in substituting discharged soldiers at lower rates than usual, the men's pensions being taken into account, and, whilst there is no objection to discharged soldiers being employed if the full rates are paid, it is held to be unfair to them, and to ordinary workers, that they should receive wages from which their pension allowance has been deducted.

Excess Profits and After-the-War Trade.—In his speech at the annual meeting of Messrs. Richardsons, Westgarth and Co., Ltd., Mr. D. B. Morison stated (according to the *Times* report) that the nature of the profits tax was such that, by reason of special circumstances, it fell more heavily on some concerns than on others. In the case of their company the scheme of reorganisation and standardisation was very necessary for its future welfare, but it was costly, and so affected their results for the period in question, and therefore their standard under the Act, that they were now, in effect, being penalised for their efficiency. If the burden of taxation was made so great as to render adequate preparation to meet foreign competition impossible, many manufacturers would assuredly be crushed out of existence. As to the profits tax, he urged that the contribution to the Government should be spread over such a period as would allow manufacturers to devote at once such a proportion of the profits they were now earning as might be necessary in order to bring their equipment right up-to-date as far as circumstances and conditions permitted.

Trade Protection Cards not Exemption Certificates.—At Bermondsey, the Town Clerk reported that he had received a reply from the Local Government Board in answer to the question as to whether a man in possession of a certificate under the schedule of the protected trades, and whose Tribunal exemption certificate was withdrawn, had the right to a further appeal to the Tribunal in case the former certificate was withdrawn. The reply, which does not cover the point raised, was that a protection certificate was not a certificate of exemption within the meaning of the Military Service Acts and the Regulations issued thereunder, or the instructions as to voluntarily attested men. Where a protection certificate was withdrawn, it was open to the man, if he was voluntarily attested and had previously held a certificate within the meaning of the instructions, to make an application for renewal not later than seven days after individual notice had been sent to him calling him up for service with the Colours. In the case of an unattested man who had held a certificate of exemption, the time allowed for making an application for renewal was two weeks from the date when the certificate of exemption ceased to be in force. Where a man had not previously made an application to a tribunal, the Tribunal were, of course, empowered to entertain a late application made by him if they were satisfied that there were reasonable grounds for allowing the application to be made.

Engineering Wages and the Cost of Living.—The Committee on Production is considering an application from the engineers for an increase on pre-war wages of 100 per cent. The application is based entirely on the increased price of living and of commodities generally. The contention is that a wage of £2 per week received before the war is to-day worth little more than £1. Since the commencement of the war the engineers have received a bonus of 12s. per week, and this they are prepared to give up if their pre-war wages are doubled.

An application has also been heard from foundrymen and others for an increase of 10s. per week to all workmen above 18 years of age (both for piecework and day rate), and 5s. per week for those under 18. This application is on present wages, which were recently increased by 12s. per week.

Some thousands of Birmingham operatives are affected by these applications, and there were present at the sitting of the Committee on Production the following local representatives: Mr. W. J. Davis and Mr. Ramsden (Brassworkers), Mr. J. H. Simpson (Gas, Municipal, and General Workers), Mr. J. Beard (Workers' Union), and Mr. Firth, National Union of General Workers).

It was stated on Monday that opposition to the engineers' application for a 100 per cent. advance was forthcoming from representatives of lower-paid operators. Their contention was that the doubling of wages of the higher paid men would operate unfairly, and the operative who earned 30s. per week was more in need of £3 than the man whose wages were 50s. of £5 per week. A prominent representative of Labour stated that there would be no finality to these applications for increases of wages so long as the prices of food and of commodities continued to increase. If the Government allowed these price advances, then logically they could not refuse wage increases in order to meet those higher charges.—*Birmingham Daily Post.*

Exemption Applications.—Surrey Appeal Court has refused a Military appeal against exemption granted to J. G. Toonjan (24), shift engineer at the Redhill Corporation electricity works.

A firm of electrical engineers appealed at Brighton for an electrical engineer (35) and an electrician (39, Class B 2), and stated that they had no other men to assist in the business. Sir John Blaker stated that the men were engaged on work which was of the highest importance to the Army, and if they went they would be employed on similar work. The men, it was pointed out, were now engaged on essential work installing apparatus on a farm in Kent. The electrical engineer was given a final two months, and the electrician three months (open).

Exemption until December 1st has been granted to J. W. Gibson (31, Class B 1), manager for the Holsworthy Gas and Electric Supply Co.

At Brighton, an electrician, who is a lieutenant in the Royal Engineers, appealed for an electrician (29, sedentary work at home), who is carrying on the business with the assistance of the appellant's father. Three months were allowed.

At Slough, Messrs. Horlick appealed for J. S. Mepstead (38, Class C 2), electrical engineer, and he was given three months' temporary exemption.

Before the Surrey Appeal Court, Mr. T. H. Hellyer (32, Class A), of Barnes, manager of a limited company of electrical engineers, who is engaged on important experimental work for the Admiralty, appealed. The appeal was respited with a view to appellant securing a protection certificate from the Admiralty.

At Chatham, Mr. W. Jensen, of the Tramway Co., appealed for four motormen, all in Class B 2. He stated that the tramcars running had been reduced from 44 to 25, and if the number of motormen was reduced it would be impossible to run all the workmen's cars. It was added that wounded soldiers had been tried, but they lacked nerve, and would not stay. All were given conditional exemption.

At Worcester, the Electric Traction Co. appealed for seven tram drivers, three in Class A, one in B 1, one in C 1, and two in C 2. One of the A men and the one in C 1 were directed to report for service in 14 days. One A man and the one in B 1 were exempted until substituted; and the others were given conditional exemption.

Before the East Kent Appeal Court, the Military Representative appealed against exemption granted to J. G. Clabburn (29), of Sturry, electrical engineer to the East Kent Road Car Co., Ltd., the only qualified engineer on the staff. The appeal was dismissed, and the exemption confirmed.

At Bromley (Kent), G. Matthews (19), electrical fitter with the Beckenham U.D.C., appealed on the ground that he was in a certified occupation, and desired to pass the examination necessary for an electrical engineer. The appeal failed.

At Aldershot, the Aldershot Traction Co. appealed for P. L. Rivett (Class B 2), works foreman, and he was given three months, with leave to appeal again.

Chelmsford Rural Tribunal has conditionally exempted A. Sayer (35, Class C 2), who runs the electric light plant at Danbury Park, and who has served in the Navy, and had had both ankles broken. He is to give two days per week on a farm.

BUSINESS NOTES.

Book Notices.—"Examples in Battery Engineering." By Prof. F. E. Austen. London: E. & F. N. Spon, Ltd. Price 5s. 3d. net.

"Mechanical Handling of Material, and its National Importance During and After the War." By G. F. Zimmer. London: Crosby Lockwood & Son. Price 10s. 6d. net.

The Temple Press, Ltd., have issued the "Cycling Manual" (7d. net), in which a great deal of useful information, fully illustrated, is given respecting the choice, care, and repair of the bicycle.

Glover's Almanac.—The whirligig of time has brought to us once more MESSRS. W. T. GLOVER & CO.'s almanac, which, like their cables, enjoys the privilege of perennial youth. The almanac is unique, in that it provides an unfailing stream of technical information, derived from a wide range of publications, and served up in tabloid form, so that the busy engineer can refresh his memory and absorb mental nourishment in small doses with the minimum expenditure of time and effort—incidentally renewing his acquaintance with the sterling merits of the firm's well-known productions. The sheet for July 1st shows Glover's winged cable drums flying from Lancashire to all parts of the world, thus suggesting the future possibilities of aviation in commerce. May peace soon return and enable this vision to be literally realised. Erecting overhead cables with the aid of an aeroplane is the subject of another illustration, which does credit to the imaginative powers of the artist, whatever may be thought of its feasibility.

Dissolutions and Liquidations.—C. J. HOBBS & CO., 86, Fratton Road, Portsmouth, electricians and contractors.—Messrs. C. J. Hobbs and F. Murgatroyd have dissolved partnership.

STEEL'S ELECTRIC AND ENGINEERING CO., LTD., 206, East India Dock Road, Poplar, London.—Winding-up order made in the High Court, June 19th.

COLSTON ELECTRICAL WORKS, LTD., Bristol.—First and final dividend 9s. 6½d., payable at Official Receiver's Office, 26, Baldwin Street, Bristol.

LARGE BROS., electrical and sanitary engineers, &c., Colwyn Bay.—Messrs. C. N. Large and W. W. Large, have dissolved partnership. Both partners will attend to debts, &c.

BIRMINGHAM ELECTRICAL ACCESSORIES MANUFACTURING CO., LTD.—Mr. E. Fisher, of 12, Cherry Street, Birmingham, who was appointed Receiver for the debenture-holder, has sold the assets. The amount realised is insufficient to discharge the debentures, but the debenture-holder has agreed to share the proceeds with the other creditors.

Catalogues.—MESSRS. ALFRED HERBERT, LTD., Coventry.—Coat-pocket edition of their small tool catalogue. It is a finely produced volume of over 600 pages, profusely illustrated with small views of a host of tools of all kinds. The catalogue is really a photographic reduction of the firm's standard catalogue, and the type is, therefore, necessarily small, but it is clear for all that.

Australian Factory Schemes.—The Australian Federal Ministry are considering, according to the *Melbourne Age*, a scheme providing for an expenditure over a term of years of at least £10,000,000 for the establishment of factories under joint private and Government supervision. The scheme includes the creation of a national industrial department.—*Times.*

Registration of Business Names.—Documents filed under the Business Names Act will be available for inspection by the public on and after September 1st. The Act provides that they should become available not before June 22nd and not later than September 22nd. The fee payable for each inspection will be 6d. To the present time the registrations number about 100,000; but it is believed that several thousands more ought to have registered. Prosecutions for default are not likely to commence until the work of indexing is complete, but the Act provides for very heavy penalties, and defaulters who wish to escape these should comply with the law without further delay. Forms can be obtained from any post office. Each form should have a 5s. adhesive stamp attached, and should be posted to or left at the Business Names Registry, 39, Russell Square, London, W.C.

Correction.—In our notice respecting the British Ignition Apparatus Association on page 675 last week, for "L.M. Magneto Syndicate" read "M-L Magneto Syndicate, Ltd."

LIGHTING AND POWER NOTES.

Accrington.—YEAR'S WORKING.—There has been a loss on the Corporation electricity undertaking of £10,155 during the past 12 months; there was a great increase in the expenditure for the generation of electricity, which cost £8,690 more than in the previous year, the increase being due to the higher price of coal and advances in wages. In addition to this loss, there is a deficit of £4,368 to be brought forward, making a total deficiency of £14,521.

Baildon (Yorkshire).—E.L. PROPOSALS.—At last week's meeting of the Council, the chairman said suggestions had recently been made that Bradford, Shipley, and the Yorkshire Electric Power Co. had approached the Baildon Council with proposals to supply electricity, but this was not true. Baildon had first approached the parties named. The business was not concluded, and disclosure would not be fair to any of the parties; the Council had powers to introduce electric power, but could not produce it as economically as it might buy it.

Birmingham.—BREAKDOWNS.—According to the *Birmingham Daily Post*, about a fortnight ago a large turbine set installed at Summer Lane about four years ago, broke down; the Electricity Committee endeavoured to have repairs effected without a general stoppage, but, owing to the heavy demands, a further breakdown occurred last Monday week. A turbine at the Nechells station, which has only been in service a few months, probably through overloading, also broke down; it is hoped to effect repairs at Summer Lane and commence running within a fortnight, but at least a month will elapse before the Nechells turbine is in working order. Should any further accident occur, the electricity department will have to reduce the supply of electricity to either factories or the tramways.

Brighton.—YEAR'S WORKING.—The report of the Corporation electricity department to March 31st last shows a total income of £109,059, expenditure amounting to £61,991, and a gross profit of £47,063, which, with £135 for dividends received during the year, totalled £47,200. After payment of £17,662 for interest, £22,592 on loans, and income-tax amounting to £1,804, a total of £42,059, there remains a surplus of £5,140, in comparison with a deficit of £3,989 in the previous year. The capital expenditure to March 31st was £844,490. During the year 9,771,615 units were sold; 16,773 tons of coal were consumed, at a cost of 40s. 9½d. per ton, the coal consumption per unit generated being 3·85 lb.—*Sussex Daily News.*

Continental.—SPAIN.—The Sociedad Hidraulica Santillana has lately secured a concession to establish a plant to utilise the water power of the river Manzanares, near the town of Manzanares el Real, in the generation of electrical energy for lighting and power purposes.

SWITZERLAND.—Owing to difficulty in procuring other supplies, the Commune of Lutz, on the shores of Lake Geneva, has set up an aluminium network of overhead mains, which serves a number of country houses spread over an area of 13 km.² (5 sq. miles), the line itself being about 51 km. (32 miles) in length, and the diameters of the wire used being from 5 to 7 mm. (·2 to ·276 in.). The system has passed successfully through the ordeals of the winter of 1916 and the snowstorms of January this year, and a hurricane of wind of 90 km. (56 miles) per hour in March last. The engineer in charge attributes his success to the careful elimination of defective wire, and to his method of forming joints, which consists in welding the ends together by pressure in a tool of novel design.

Dundee.—PRICE INCREASE.—The Corporation has found it necessary to increase the price of electricity. The department's year closed with a deficit of £2,646, which, with the credit on hand at the beginning of the year of £3,244, made the loss for the period £5,891. The revenue was £1,940 less than last year, while the expenditure showed an increase of £4,360. It has been decided to raise the whole of the prices for current, instead of adding a percentage increase to the consumers' bills, and the increase will amount to ¾d. per unit on lighting and to ½d. on power. At the T.C. meeting the convener of the Electricity Committee pointed out that the increase imposed only amounted to 10 per cent., as compared with 27 per cent. in the gas department since the beginning of the war.

Halifax.—In regard to the Electricity Committee's proposal to take advantage now of an option to purchase land for the site of future electricity works at Copley, it was stated that the option had been extended from July 15th to August 4th; there is no disagreement as to whether the suggested site is the most suitable for the purpose.

Hull.—YEAR'S WORKING.—The report of Mr. J. F. Magoris, acting city electrical engineer, on the working of the Corporation electricity undertaking for the year ended March 31st last, shows that the total revenue amounted to £99,991, working expenses to £60,095, and the gross profit was £39,896. After meeting interest, sinking fund, special and income-tax charges, the net balance placed to reserve was £1,209. The cost of fuel delivered to the works increased by about 35 per cent. During the year four important bulk supply contracts have been entered into, and the engineer reports that energy has been supplied for steel rolling. The total connections to the mains equal 31,960 KW., including 23,584 KW. of power and 8,396 KW. of lighting load. Terms are being discussed for a supply of energy to the tramways department, which will involve laying new mains and installing certain switchgear, at a cost of £4,800.

London.—LAMBETH.—A communication has been received from the B. of T. stating that it has approved of the County of London Electric Supply Co., Ltd., and the South London Electric Supply Corporation, Ltd., entering into an agreement for the supply of electricity in bulk by the first-mentioned company to the second-mentioned company.

Luton.—YEAR'S WORKING.—The accounts of the Corporation electricity undertaking for the year ended March 31st last show a total income of £52,149; working expenses amounting to £35,034; and a gross profit of £17,115, as compared with £16,727 in the previous year. With other amounts brought in, the total available was £17,909, and after deducting financial charges, the surplus for the year amounted to £5,025, as against £6,228 in the previous year. This sum was carried to the appropriation account, which, after allowing for deductions during the year, has a balance in hand of £12,748. The balance of the reserve account stands at £6,489. During the year, 14,227,136 units were sold, as compared with 12,254,529 in the previous year, the maximum load amounting to 4,937 KW.; 7,156 H.P. of motors and 1,929 KW. of heating and cooking were connected.

Morecambe.—At the monthly meeting of the T.C., last week, the chairman of the Electric Light Committee moved that the resolution previously passed by the Council to increase the price of electricity for power to 4d. per unit be rescinded, and that the price be 3d. He urged the importance of the electricity works having a day load. After a long discussion, the lower figure was agreed on.—*Lancashire Daily Post.*

Perth.—The railway companies are to be approached by the T.C. with a view to fixing a new contract for the supply of electricity. The railways are the Corporation's largest consumers.

Shrewsbury.—YEAR'S WORKING.—After paying interest on loans and sinking fund charges, the electricity undertaking shows a deficit for the year of £921.

The T.C. has, from the June quarter meter readings, increased the price of current by 33⅓ per cent., instead of by 20 per cent., owing to the great increase in the cost of coal and other material.

Southend-on-Sea.—PRICE INCREASE.—The T.C. has decided on an all-round increase in the price of electricity, lighting being approximately ½d. per unit and power ¼d. per unit more.

South Wales.—The B. of T. has extended for a year from July, 1917, the period mentioned in the Cowbridge and Penybont and Abercarn Provisional Orders of the South Wales Electrical Power Distribution Co.

Stowmarket.—PRICE INCREASE.—In reply to a petition, the Suffolk Electricity Supply Co. has informed the consumers that it cannot reconsider the decision to increase the price of electrical energy from 8d. to 10d. per unit, as the advance is warranted, and should have been made long ago.

Warrington.—PRICE INCREASE.—The Corporation has given notice that the price of electrical energy will be increased by 10 per cent. above the existing scale.

TRAMWAY and RAILWAY NOTES.

Blackpool.—ELECTRIC VEHICLE.—The Corporation has purchased an electric refuse collecting van. The chassis has been supplied by the General Vehicle Co., and the body built at the Corporation's own works. During the past winter one of the electric street watering vans was altered temporarily, so as to serve for refuse collection, and the experiment was so successful that the Cleansing Committee decided to install a special vehicle for the purpose. The new van will do the same amount of work as would be performed by four horse-drawn vans.

Croydon.—BONUS.—The B.C. has decided to increase the weekly war bonus to the tramway workers to a total of—for drivers and male conductors, 5s.; female conductors, 2s. 6d.; other grades, 7s.

Huddersfield.—The Tramways Committee has informed the local Volunteer authorities that it is unable to grant free tramway facilities to Volunteers travelling to and from drill.

London.—ELECTRIC VEHICLES.—It is announced that Messrs. J. Lyons & Co., Ltd., the well-known caterers, have decided to expend £80,000 on electric vehicles of the commercial type.

Manchester.—The Corporation Tramway employés of Salford and Manchester, being dissatisfied with the grant of 2s. 6d. per week, instead of their demand for 10s. per week, have decided to refuse to work more than the necessary number of hours, thus stopping all overtime, and also not to allow more passengers on the cars than the legal load. The cutting down of the services owing to war conditions has made overloading frequent. The employés are seeking to reopen negotiations with the Committee on Production, with a view to obtaining the full amount asked for.

The refusal to work overtime or to overload cars is putting the public to an enormous amount of inconvenience during the week. The attitude of the men is described by Alderman Bowes, the chairman of the Manchester Corporation Tramways Committee, as not playing the game, and it is pointed out that the war bonus to Manchester drivers and male guards now amounts to 10s. a week, and women guards 7s. a week. The Manchester employés, however, ignoring their own officials, decided to continue their obstructive tactics, and there is reason to fear that the unrest will spread to other towns. The attitude of the workers is arousing great indignation amongst the public.

Nelson.—The T.C. has decided to grant double pay to tramway employés who work during holidays.

Stoke-on-Trent.—TRAMWAY LEASE.—There is strong local opposition to the proposal of the Council to renew the lease of the Potteries Electric Tramways until 1932. After a long discussion at the last meeting of the Council, the matter was adjourned until June 28th. The new agreement proposes that the company should carry out certain improvements in the permanent way and rolling stock, not increase fares, and pay to the Corporation £1,000 per annum during the term of the lease.—*Birmingham Daily Post.*

West Ham.—The tramway manager reports that it is inadvisable at present to proceed with the authorised work of doubling the tramway track in Connaught Road; however, the span-wire system is to be substituted for the present bracket arms. Cars are to be allowed to resume normal lighting inside, provided that the lighting circuits are so arranged that the whole, except the ordinary traffic lights, can be switched off in an emergency.

TELEGRAPH and TELEPHONE NOTES.

Birmingham.—Additional accommodation is to be provided by the Corporation for wireless telegraph students. The P.M.G. states that there is a shortage of wireless operators in the merchant service, and arrangements have been made with the War Office to issue certificates of protection to students training for the P.M.G.'s certificate.

Hull.—After meeting all expenses, there is a surplus of £5,355 on the year's working of the Corporation's telephone undertaking, as compared with £3,645 for the previous year.

India.—The selector telephone system of the Western Electric Co. has been adopted by the G. I. P. Railway, and is already in use on the section between Bhusawal and Nandgaon, a distance of 98 miles, on which there are 31 connections and 58 trains a day. In this system a 200-lb. return copper wire is used, and any station can be called up independently of the other stations.—*Indian Textile Journal.*

Morse Code on Ocean Cables.—Mr. William M. Bruce, president of the United Telegraph and Cable Co., of Springfield, Ohio, announces that he has practically perfected an appliance by which the Morse code can be used on trans-oceanic cables. The company has closed a contract with the Commercial Pacific Cable Co. for equipment for the cable from San Francisco, Cal., to Shanghai, China. Mr. Bruce's work consists of a method for the employment of Morse equipment (key and sounder) on submarine cables. His patents also cover an improved relay for cable work, which can be used not only for the Morse, but for the regular recorder type of signals as well. Actual tests have proved this instrument to be very efficient. Mr. Bruce has operated direct from London to New York by his system, and direct communication between Canso, N.S., and New York is now in regular service, the operator at New York receiving the signals direct from the sounder. This line includes a stretch of cable between Canso, N.S., and Rockport, Mass., on which the siphon recorder system has been employed hitherto. Mr. Bruce is a telephone engineer, and was recently chief engineer and general superintendent of the American Automatic Telephone Co.—*T. and T. Age.*

Spain.—The recently-formed Compania Iberica Telecomunicacion has applied to the Diputacion of the Province of Viscaya for leave to "establish the first installation in all Europe of its system of communication." It proposes to set up a first trial station to transmit weather forecasts from the Observatories to the fishing fleet, on the results of which the Diputacion will base its further course of action.

Telegram Rates.—Telegrams may now be sent to Bagdad at the rate of 2s. 3d. per word, and to Sarawak at 3s. 8d.—4s. per word.

Telephone Traffic.—From time to time the Post Office issues for the use of its staff instructions dealing with telephone traffic subjects, such as:—Standards of operating loads and service (local and trunk working); operating procedure and switchroom rules; service code markings; switchboard markings and colour schemes, &c. As these indicate current practice and procedure, they should be of interest to British contractors and consulting engineers who specialise in telephone exchange construction, and copies may be had on application to the Secretary, General Post Office, London.

United States.—The Western Union Telegraph Co. has placed its facilities at the disposal of the Government to teach 2,500 operators. All cable telegrams to and from the United States must now conform to the censorship regulations, which are practically the same as the British and French regulations.

The American Marconi Co. is erecting a large addition to its works, to cope with the rush of orders, which will employ 1,000 workmen.—*T. and T. Age.*

CONTRACTS OPEN and CLOSED.

OPEN.

Australia.—SYDNEY.—August 22nd. N.S.W. Government Railways and Tramways. Thirty-six induction motors (Specification No. 488). September 19th.—One 225-H.P. synchronous motor (Specification No. 489). Particulars from Electrical Engineer's Office, 61, Hunter Street, Sydney.

Glasgow.—Electricity Department. Boiler-house plant. E.H.T. switchgear (20,000 volts). See "Official Notices" June 15th.

Newport (Mon.).—June 30th. Electricity Department. Induced-draught plant, additions and extensions to fuel economisers and cooling towers. See "Official Notices" June 15th.

Spain.—Municipal Authorities of Berlanga (Province of Badajoz): Concession for the electric lighting of the town during a period of six years. Town of Villademat (Province of Gerona): Electric lighting concession for 10 years.

Wolverhampton.—June 30th. Electricity Department. Cooling towers, motor-driven pumps. See "Official Notices" June 15th.

CLOSED.

Brighton.—B. of G. Electrical fittings: Adams Bros., £43.

Fleetwood.—Council. Wentworth Silkstone Collieries, Ltd,, 2,000 tons of slack for electricity works.

Grays.—U.D.C. Coal for the electricity works: Dinham, Fawcus & Co., Griff steam, 23s. 2d. per ton; deep Griff, 25s. 2d.

Rochdale.—The Council has accepted a tender for a new boiler for the electricity works.

Venezuela.—The Venezuelan "Ministerio de Fomento" has placed contracts for the construction and working of telephone lines as follows:—

Sr. A. J. C. Herrera, of El Callao, Roscio District, Bolivar.—94-mile line.
Sr. C. R. Paredes, of Nirgua, State of Yaracuy.—123-mile line.

The full text of the contracts in Spanish can be consulted at the Board of Trade Department of Commercial Intelligence.—*Board of Trade Journal.*

FORTHCOMING EVENTS.

Tramways and Light Railways Association.—Friday, June 29th. At 3 p.m. At the Institution of Civil Engineers, Great George Street, S.W. Annual congress.

Royal Institution of Great Britain.—Monday, July 2nd. At 5 p.m. At Albemarle Street, Piccadilly, W. 1. General monthly meeting.

OUR HALF-YEARLY INDEX.

As it is necessary to effect every possible economy in paper consumption, the Index to Vol. 80 of the ELECTRICAL REVIEW, which will be printed in the course of a few weeks, will be supplied only to those who, through the post, specially apply for it. To such it will be supplied for 3d. post free. Any reader or advertiser at Home or Abroad who requires a copy for binding, or for other purposes, is asked to make application therefor promptly to: The Publisher, ELECTRICAL REVIEW, 4, Ludgate Hill, London, E.C. 4.

NOTES.

The British Trade Corporation Prospectus.—The prospectus of this much-discussed corporation was issued on Wednesday last. The issue is of 150,000 shares of £10 each at par. The total capital is to be £10,000,000 in £10 shares, of which 100,000 shares have already been subscribed and allotted at par. Thus the issued capital will be £2,500,000. Applications for shares have to be accompanied by a declaration of the applicant's British nationality. Lord Faringdon is Governor, and the directors include Mr. F. Dudley Docker, C.B., Sir Vincent Caillard (Vickers, Ltd.), Sir Algernon Firth, Mr. J. H. B. Noble (Sir W. G. Armstrong, Whitworth & Co., Ltd.), Sir W. B. Peat, &c.

Patents and Alien Enemies.—Under the heading of "Applications vested in the custodian and licences granted," the Patent Office gives the name of the Paterson Engineering Co., Ltd., as applicants for licences in respect of applications Nos. 3,666/14 and 10,374/14, for which applications were made by Ornstein.

Tyneside Electrical Men and Industry.—A meeting called by the Electrical Section of Newcastle Chamber of Commerce was held in the Guildhall, Newcastle-on-Tyne, on June 19th, Mr. H. W. Clothier in the chair.

The chairman presented the following report, indicating the scope of the Section:—

The need for national organisation is now well recognised. In pre-war days certain trade organisations existed for the protection of sections of the community. The tendency now is to strengthen the existing organisations, and to promote new ones having a collective interest in the national prosperity. Whilst the war engages our first and urgent attention, the time which can be devoted to prospects of trade after the war must necessarily be limited, but the best opportunity must be taken to secure whatever time is available to help in making the moulds which will give shape to the industry of the future. In view of the prominent place Newcastle has taken in engineering from time to time, it is fitting that in electrical progress it should be an example to the rest of the country. Even though this may not be always accepted outside, the experiences achieved in this district are certainly of great national value, and the variety of these experiences gives a weight to any collective expression of views emanating from the North-East Coast. To put the experiences into concrete and more useful form, it is proposed to consolidate the Electrical Section of the Chamber of Commerce.

The chairman also gave the following as an outline of the work of the Section:—

1. To represent the local electrical industry.
2. To give collective attention to matters of commerce affecting the progress of the electrical industry in this district.
3. To discuss subjects which apply to the national prosperity, and to communicate, where necessary, considered local opinions to Government departments and national industrial associations.
4. To be the channel for communication with Consular officers abroad, and the dissemination of commercial information to firms immediately interested.
5. The question of cheap and unlimited power supply for manufacturers after the war.

On the motion of the chairman, seconded by Mr. C. Vernier, it was agreed to endeavour to strengthen the Section by means of an increased membership.

The Conjoint Board of Scientific Societies.—The fourth meeting of the Conjoint Board was held at the Royal Society, on June 13th, to receive the report of the Executive Committee on the work of the previous six months.

Amongst a number of questions of scientific and industrial importance which have occupied the attention of the Board was an inquiry into the desirability or otherwise of the adoption of the metric system throughout the British Isles. The Sub-Committee on National Instruction in Technical Optics reported that a scheme approved by the Board of Education had now come into operation. A Sub-Committee, having considered special cases of magnetic disturbances revealed by a magnetic survey of the British Isles and their possible connection with the occurrence of iron ores, recommended a detailed investigation of two test areas, in order to ascertain how far, under the conditions of the British iron ores, the magnetic survey was likely to prove of economic value. Arrangements for carrying out the investigation are in progress.

An Agricultural Sub-Committee, with the Earl of Portsmouth as chairman, reported that it was at present devoting itself mainly to engineering questions. It is engaged in collecting information with regard to the transport of raw materials to farms and agricultural products from them, and to the power required for this purpose and for seasonal operations on the land, with a view to comparing the relative advantages and costs of steam or internal-combustion engines and electrically-operated machines. It is dealing also with the possibility of co-operation in repairs and skilled labour, and is considering the various types of tractor most suitable to large and chiefly arable farms and to moderate-sized mixed farms, having regard to the different local circumstances and requirements. A Sub-Committee was nominated to report on what is at present being done to ascertain the amount and distribution of water power in the British Empire. A complete report of the first year's work of the Board will be published in due course.

Legal.—AIR RAID WARNING: POWER CO. FINED.—At the Hertford Borough Sessions the North Metropolitan Electric Power Distribution Co. was fined £5, and £1 5s. costs, for a breach of its conditional exemption as to the obscuring of lights on May 24th, by failing within 15 minutes to answer an official telephone call communicating warning of an air raid.

MR. E. ZOLLER, manager of the company, pleaded not guilty. He said that no call was received. In his opinion the cause of the call not being received was the sagging of the overhead wires from the office to the power station, causing them to touch. They had since been strained and overhauled.

MR. H. W. SWANN, the company's engineer at Barnet, gave similar evidence, and the engineer who was on duty at the time said that no call was received.

ELECTRICAL INSTALLATION AT A PICTURE PALACE.—Mr. Muir Mackenzie, High Court Official Referee, on June 16th, delivered judgment in the action of Mears *v.* Weston & Sons, in which damages were claimed for breach of contract in regard to the lighting of a cinematograph theatre at Richmond. The hearing was reported in our issue of June 15th. The Referee gave judgment for the defendant.

The Board of Trade Electric Power Supply Committee.—In reply to a question in the House of Commons, Mr. G. H. Roberts, speaking on behalf of the Board of Trade, gave the names of the members of this Departmental Committee. He said that the chairman (the Right Hon. F. Huth Jackson) had recently resigned on the advice of his doctor. The President was taking steps to appoint a new chairman and to increase the representation of local authorities owning electricity supply undertakings. He hoped to announce the names in the course of a few days. He could not say when the Committee would be in a position to make a report.

Profit-Sharing.—The Archbishop of York, in addressing the Leeds Chamber of Commerce, last week, on "The Industrial Outlook," said that while he believed in co-partnership and profit-sharing, they could only be realised as results, and should not be made the *cause* of better relations between employer and employed. Of course, we must have prosperous industry before there would be profits to share, and prosperous industry would result from better relations being encouraged by just and humane treatment, and by the wise application of "Welfare" effort.

Luncheon.—At the luncheon meeting of the British Empire Producers' Organisation yesterday, at the Savoy Hotel, the Hon. W. A. Holman, Premier of New South Wales, was the guest, and Lord Sydenham of Combe was in the chair.

Hardening Gauges.—The Hardness Tests Research Committee of the Institution of Mechanical Engineers has had some tests carried out at the National Physical Laboratory on samples of steel supplied by the Westminster Electrical Testing Laboratory; two test pieces were hardened "glass hard" in the ordinary manner, while two others of the same steel were hardened by the Wild-Barfield process. The tests showed that while the former gave the higher results under Brinell and scleroscope tests, the latter were markedly superior in resistance to sliding abrasion; as the process is being used for hardening screw gauges in large quantities, resistance to wear is of the first importance. Another valuable feature of the Wild-Barfield process is the fact that the dimensions of the gauges are so slightly changed that they rarely require lapping, so that it is particularly suitable for hardening screw gauges.

Wages of Women in Electricity Works.—The Ministry of Munitions has sent electricity undertakings statutory rules and orders which apply to controlled establishments, and which lay down the following schedule rates of pay for women :—

Workers under 15 years of age	..	..	2½d. per hour.
" 15 years of age and under 16	..	..	3d. "
" 16 " " 17	..	..	3½d. "
" 17 " " 18	..	..	4d. "
" 18 " and over	..	..	5d. "

National Insurance (Unemployment) Acts, 1911 to 1916.—Contributions are payable in respect of :—

2,318 X. Workmen engaged in the manufacture and assembling of metal parts of electrical water heaters.

2,320 X. Workmen who are employed in establishments which are mainly carrying on any insured trade or munitions work, and who are engaged in the maintenance and repair of railway lines. (Application 495.)

This decision reverses decision B. 1,419 (*Board of Trade Journal* of February 5th, 1914). In accordance with Sec. 3 (2) of the National Insurance (Part II Amendment) Act, 1914, contributions in respect of workmen covered by this decision but previously excluded in virtue of decision B. 1,419, are payable as from June 21st, 1917.

Contributions are not payable in respect of :—

2,319. Workmen employed by railway companies.

In connection with the mechanical engineering establishments :—

1. Employed in works or in yards or stores immediately connected therewith :—
   - (*a*) Persons not employed wholly or mainly by way of manual labour, such as chain examiners and testers, chemists, boiler and engine inspectors, material checkers, storesmen, watchmen, fire station attendants.
   - (*b*) Telephone attendants, gas makers and stokers (for general illumination of works, houses, carriages, stations, &c.), pumpers filling locomotives, saddlers repairing harness, locomotive engine drivers, shunters, platelayers, messroom attendants.

2. Other employés :—
   Electric linemen and wiremen (maintenance of telephone lines and apparatus at railway stations, &c.), locomotive engine drivers, enginemen, crane drivers, excavators, paviors, labourers, and others employed in connection with uninsured trades, water fitters keeping in order pumps about the railway system.

In connection with carriage and wagon works :—

1. Employed in works or in yards or stores immediately connected therewith :—
   - (*a*) Persons not employed wholly or mainly by way of manual labour, spring testers, storekeepers, timber selectors and markers, weighmen.
   - (*b*) Caners making portable chairs, hair carders, horse drivers shunting carriages and wagons in use, carriage washers, laundresses, sheet makers.

2. Other employés :—
   Enginemen, labourers, and water fitters employed in connection with uninsured trades.

In connection with workshops at which steam and other vessels are repaired :

Labourers connected with loading and unloading, or other uninsured trades, ferrymen, sailmakers, and storesmen and watchmen not engaged wholly or mainly in manual labour.

Employés engaged in dredging harbours or entrances to harbours in connection with docks, or in the engineering department of canals; all men engaged in maintenance and repairs of works (excluding repairs of buildings, machinery, vehicles, or ships, and the manufacture of metal goods for the purpose of repair of works or sawmilling and machine woodwork).

Volunteer Notes.—COUNTY OF LONDON ENGINEER VOLUNTEERS (FIELD COMPANIES).—Headquarters, Balderton Street, Oxford Street, W.

Orders for the week, by Lieut.-Colonel C. B. Clay, V.D., commanding :—

Monday, July 2nd.—Technical instruction for No. 3 Company, Right Half Company, at Regency Street. Drill, No. 3 Company, Left Half Company. Signalling Class. Recruits' Drill, 6.30.

Tuesday, July 3rd.—Lecture, 6.30. Physical drill and bayonet fighting, 7.30.

Wednesday, July 4th.—Drill, No. 1 Company, Left Half Company.

Thursday, July 5th.—Drill, No. 2 Company, Left Half Company. Ambulance Class, 6.30. Signalling Class.

Friday, July 6th.—Technical instruction for No. 3 Company, Left Half Company, at Regency Street. Drill, No. 3 Company, Right Half Company. Recruits' Drill, 6.30.

Saturday, July 7th.—N.C.O.'s Parade, 2.30; under Platoon Commander Watkins. Map reading.

MACLEOD YEARSLEY, *Adjutant.*

The First County of London Engineer Volunteers is the only engineer volunteer corps open to all engineers; it has already furnished to the fighting Forces about 1,200 men, many of whom have obtained commissions. All companies are instructed in infantry drill, and in knotting, lashing, temporary bridge building, raft and other expedients for crossing water; technical instruction is given at the headquarters of the London Electrical Engineers in the working and management of searchlights and internal combustion engines, and all companies are available for the important work of trenching in connection with the London Defences. Musketry and signalling instruction is also provided, and field work is carried on under the supervision of officers of the Royal Engineers. All men who have been granted exemption, or are badged, should train as Volunteers, so that in the event of invasion they could take their share in the defence of the country as soldiers; those who are unable to take an active part in the work of the corps can assist it by becoming honorary members, whose subscriptions are devoted to defraying the general expenses incurred by the corps in carrying out its training. Those of our readers who are willing to further this patriotic movement, which is worthy of their hearty support, may obtain full information from the Adjutant, Balderton Street, London, W. 1.

The A.E.G. and the B.E.W.—A fresh increase of share capital is proposed by the A.E.G. in order to render assistance to one of the company's earliest promotions—the Berlin Electricity Works Co. After the transfer of the latter's supply works to the Berlin Municipal Council, about two years ago, the company became solely an investment company, which, it was hoped, would still be able to yield satisfactory dividends to the shareholders, of whom the A.E.G. is one with an interest of 80 per cent. of the total share capital. One of the investments, which was initiated before the transfer, related to the great power station which was then projected at the lignite mining fields of Golpa-Jessenitz, which belongs to the Electro Works Co., and which, on the outbreak of the war, was requisitioned for the supply of electrical energy to Imperial works for the production of cyanamide. The plant and installations at this lignite station are stated to be technically faultless, but the production of lignite has been beset with difficulties owing to unfavourable earth conditions and the scarcity of labour, whilst the considerable requirements of the boiler furnaces have rendered it necessary for a large quantity of pit coal to be purchased to assist in meeting the needs of the station. Under the circumstances, the cost of production largely exceeds the estimates made in the pre-war period, and as the sale price of energy is fixed by contract, the prospects of the Electro Works Co. proving commercially successful are remote. A total of £2,250,000 has been invested in this company in the form of share capital and loans, one-half having been furnished by the A.E.G., and the other by the Berlin Electricity Works Co. Now the former proposes to take over the latter's interests in the lignite power station, and offers new A.E.G. shares of £800,000 in exchange for the £1,125,000 of shares and loans held by the Electricity Works Co. in the Electro Works. As the new A.E.G. shares are entitled to participate in the dividend for 1917-18, it will be obvious that this company is rendering assistance, which is greatly needed, if the Electricity Works Co. is to continue as prosperous as formerly. At the same time, the latter has the right of re-purchasing the shares within a period of five years.

A Rival to X-rays.—The Patents Court has recently disclosed that the Röntgen rays are no longer the only agency which will enable organic bodies to be examined internally. A remarkable process was discussed when the Trustees of the South Kensington Museum (Natural History Section) applied for licence to use a German patent which imparts to animals a transparency so thorough that every bone, muscle, and artery can be seen distinctly through the skin.

Dr. S. F. Harmer, F.R.S., who made the application, said the transparency was not something vague, like a radiograph, with blurred outlines; it was a transparency vivid and direct as that of glass itself. The supreme advantage of the method was that every specimen treated became a permanent object lesson for study purposes or museum exhibition. He had a rat whose every organ could be seen. The process employed the principle of the refraction of light, and it relied upon chemical solutions, made according to formulæ, to have each a required index of refraction.

The Controller of Patents (Mr. Temple Franks) said he thought nothing should be allowed to stand in the way of the authorities at the British Museum making full use of this process, though he did not see how anyone could very well claim a patent right in the principle of the refraction of light.

A.S.E. Funds.—The annual financial statement of the Amalgamated Society of Engineers shows capital funds worth £1,743,554.—*Times.*

New Patents.—In his report for the year ended 1916 the Comptroller-General of Patents, &c., states that applications for new patents numbered 18,602 ; 13,641 provisional and 10,700 complete specifications were submitted, and 8,424 patents sealed, applications in 1915 having been 18,191, of which 11,457 were sealed. There was an increase of £11,417 in the receipts from patent fees. On the other hand, there was a further decrease in the receipts from design fees and sale of publications. The total receipts amounted to £292,731, being £10,260 more than in 1915. The surplus of total receipts over expenditure was £107,492, as compared with £94,298 in the previous year.—*Financial Times.*

Australian Electricians with the Forces.—The secretary of the Electricians' Union stated that a great many members of the Union had gone to the Front, and tradesmen were rather scarce. Although a decided slump had occurred in the earlier part of the year, and a number of men were still liable to be discharged from State Government Departments, this had been counteracted by a demand in other directions. Large business concerns that depended almost entirely upon electric "drive" had lately applied for men. The labour required was that of electric fitters, armature winders, and for general installation work.—*Sydney Daily Telegraph*, May 21st.

Bonuses for Station Staff.—Owing to the extra work during the past few months in consequence of breakdowns, the West Ham Electricity Committee suggests special bonuses as follows :—Four senior shift engineers, £20 each ; three assistant shift engineers, £4 each ; three junior shift engineers, £3 each.

Coal Concreted from Ashes or Dusts.—In a paper read before the Society of Architects, on June 7th, Mr. R. Goulburn Lovell, A.R.I.B.A., stated that in co-operation with Mr. C. M. Hughes he had evolved a process which would enable a fuel to be made without pressure at any industrial locality from the waste products to be found in that locality which might possess any calorific value. This process was part of a great scheme for the proper utilisation of fuel ; it provided for immediate necessities and utilised a residual product now of comparatively small value.

"Coals" were shown which had been concreted from coal dust, coke dust, destructor ash, destructor ash and coal dust, and from clinker, bar ash, and sawdust. The better grades burnt like Nature's coal, the lower grades like coke ; they all flared, coked, and incandesced. The machinery and plant required practically existed in all industrial centres. The essentials were crushers or breakers, screens, drying tables, mixers, and moulds such as cast-away pails, baths, &c. For the cooking process either ovens or boilers could be used, the main object at the present time being to utilise any existing plant with unskilled labour.

The cost depends mainly upon the value put upon the bases, the cost of the matrices, such as glucose, pitch, and other bitumens, and the cost of the chalk or other calcium carbonates.

The following examples were given for the cost of materials in shillings :—

Calorific values. B.TH.U.	Samples.	Per ton.
7,500	No. 1, Eastbourne destructor ash	11·0
8,040	No. 2, Maples destructor and coal dust ...	4·6
10,320	No. 3, Maples destructor and sawdust ...	9·0
10,540	No. 4, Birmingham destructor and coal dust	8·0
11,840	No. 5, Birmingham coke dust	7·0
12,600	No. 6, London coke dust	10·0
12,820	No. 7, Staffordshire coal dust	10·0

The cost of the labour and establishment charges in the British Isles would not be more than 5s. per ton.

Mr. H. W. Bowden, chief electrical engineer to the Poplar Borough Council, said that from the central station point of view, the removal of ashes and clinkers was a very serious item. He had 150 tons to dispose of per week, and had to pay 3s. 6d. to 4s. per ton to have it removed. In his case, in the riddlings that went through the chain grates there was a considerable amount of useful coal, which went away in the ashes. He had tested this, and found it contained about 4,000 B.TH.U. He had also a destructor which gave about 20 to 30 tons of clinker per day, in which he thought there was no heat value. He was quite sure his Borough Council would be prepared to consider the thing very seriously.

Mr. Lovell said the ash from the dust destructors was the thing that could not be got rid of, whereas the clinker was found useful for road-making purposes. It was the ash that he was anxious to handle in his process, and he would be willing to carry out a test on the ash from Poplar, which he thought would probably produce 4,000 to 5,000 B.TH.U., and could be increased by the process to 10,000 or 15,000 B.TH.U. He proposed to use existing plant, such as concrete mixers, which was lying idle all over the country. The residue from burning this artificial coal could be used up again in the same way. With regard to the licence to manufacture, in addition to the condition that the coal must not be sold at more than 25 per cent. profit, the conditions were that the ash or refuse which was to be used in any particular case should be sent to him for test and for determining the right formula for the mixture. For this test 50 or 60 guineas would be charged ; and further, he asked 7d. per ton as a royalty on the whole of the material produced by the licensee. He had received an estimate from responsible people to make the coal at 6s. per ton for the actual making.

Mr. W. R. Cooper said he was not quite sure whether the author realised what was being done already in the way of briquetting, The assumption was sometimes made that slack and coke breeze could not be used for steam raising that was a mistake, so that all that was left was the fine dust, and he was not sure that there was so much in that as the author seemed to imply. There was a popular idea that there was a great deal of waste coal of a valuable character to be found at the pits, but that was not the case. The author added incombustible matter to the fuel, and he would like to know the percentage of ash in the fuel to start with, and the percentage of ash in the final product. Obviously the higher the ash the less the value of the fuel.

Electricity v. Gas.—At the annual general meeting of the Waverley Association of Gas Managers, held in Edinburgh, on Friday last, Mr. J. D. Keillor (Hawick), the president, in the course of his address, said the opposition of electricity was so formidable that if gas was to maintain an honourable position in the realm of light and power they would have to apply a driving force so great and of such endurance that their place would be for ever assured, and that gas would be a force to be reckoned with. They should remember that they were not monopolists in the supply of light and power. Their rival had received all the care and support that scientific thought and influence could bestow upon it, and speaking generally, had enjoyed an amount of patronage and encouragement never bestowed upon gas. To what extent it might in future be developed was a matter of speculation, but he felt sure that soon its opposition would be more formidable than ever. Their attention had been directed to a movement in which the Board of Trade was taking an active part—the proposal to link-up electric supply undertakings in certain industrial centres. This was a very serious attempt to regulate and foster the resources of an industry in the national interest, and for the gas industry it was a matter of the greatest moment, possibly having a disastrous effect unless they could combat it. If such a scheme was possible with electricity, it should not be impossible to attain similar results with gas.

German Scarcity of Copper.—The following appeared in the "Through German Eyes" column of the *Times* on Wednesday :—

"COPPER FOR THE SUBMARINES.—The *Frankfurter Zeitung* announces that the Government has now requisitioned all electrical machinery and apparatus, and it is no longer possible to buy or sell electric motors without special permission.

"An article in the *Cologne Gazette*, describing a visit to the Imperial yards at Kiel, which are said, like the Imperial yards at Dantzig and Wilhelmshaven, to be mainly, but not entirely, engaged with repairing work, contains the following passage on copper and electricity :—

"Copper is now used in large quantities in all ships, although, of course, consumption is restricted as much as possible. Especially for steam piping there is no substitute for copper, and it is also needed for all purposes where high resistance to sea-water and salt air is necessary. Nothing seems yet to be known at Kiel about a scarcity of copper, and if our enemies think that they can starve us out by cutting off the red metal, they will be just as much deceived in this as in the rest of their starvation scheme. It is pleasant to see how the long, thin copper tubes are formed, snake-like, by skilful hands. . . .

"Over against the boiler shop is the electrical shop, which becomes every day more important with the increased use of electricity. We have already gone a long way in this, although we have not yet gone quite so far as the Americans, who even drive the screw-shafts of large ships by electric motors. As regards our submarines, it is, indeed, much the same with us, for our submarines already consist half of electricity. The submarines are also concerned with the accumulator shop, where accumulators are repaired. Repair is not always possible, for the demands made on the accumulators in war are sometimes too great."

Electric Coal-cutters : Australian Judge's Decision.—An Australian newspaper just to hand (dated May 16th) quotes a Sydney dispatch to the effect that Judge Fitzhardinge, who was umpire in the recent Bulli Colliery coal-cutting case, decided that the practice of using electrical coal-cutters in the Bulli seam of the Bulli Colliery was dangerous, and, in the interests of the miners and of the mine, should be at once discontinued. His Honour directed that the cost of the umpire and arbitrators, and of the Arbitration Court, shall be paid by the owners of the Bulli Colliery.

Fatality.—An inquest was held at Murton (County Durham), last week, upon the body of a 13-year old boy named Joseph Wilson, who died as the result of an electric shock. The child's father found him lying unconscious about 3 or 4 yards away from an electric pole. He was dressed in knickerbockers, but had neither shoes nor stockings on. The knickerbockers were burnt down to the knee of the right leg. He died two days later. A playmate said the deceased climbed the wire support of the electric pole. He was walking on his bare feet along the lower stay wire, and was holding on to the upper wire. She heard a noise, saw a flash, and then deceased fell to the ground. A boy witness said he saw the flash, which extended from one pole to another. The doctor, in giving evidence, said he thought the deceased could not have been holding on to the live wire with his hands, but must have just touched it with his right thigh. On the night following the mishap deceased collapsed and died of paralysis of the heart muscle, due to the electric shock. The fall had nothing to do with the cause of death. A verdict in accordance with the medical evidence was returned, the jury adding that no blame attached to the Newcastle Electric Supply Co., Ltd., owners of the equipment concerned.

Appointments Vacant.—Lecturer in electrical engineering, for the University College, Nottingham. See our advertisement pages to-day.

Decimal Coinage and the Metric System.—A Committee of the Institute of Bankers, appointed to consider the adoption of a decimal coinage and the metric system of weights and measures, has issued a report recommending the change, provided that the coinage be based upon the retention of the present gold sovereign as the unit of value, divided into 1,000 mils. The Committee holds that the existing system of weights and measures is an obstacle to the extension of our export trade, and advocates the adoption of decimal coinage, in the hope that it will be the first step towards the introduction of the metric system. The universal standing of the pound sterling precludes its abandonment as our standard unit, even in name only. The use of the term "cent" is considered undesirable, and the objection that the subdivision into mils involves the use of three places of decimals is met with the reply that, as compared with the system in which the florin is the unit of account, there would be one digit less to the left of the point. The Committee is confident that as regards the gold and silver coinage the transition would present no serious difficulties; the change of 4 per cent. from the value of the penny to that of the four-mil piece would be quickly adjusted, especially as the decrease in the purchasing power of the penny during the war has accustomed the public to such adjustments. The Committee considers that the change cannot be made before peace returns, as it will necessitate alterations in adding and calculating machines which cannot be effected under present conditions, but urges that the necessary legislative steps should be taken, without delay, and that an educational campaign should be organised to habituate the public and the staffs of the banks to the new system.

The British Chamber of Commerce for Italy has passed a resolution emphatically urging the adoption (by the United Kingdom) of the metric system.

Engineering Students.—Under this title the Junior Institution of Engineers has issued a pamphlet embodying a scheme drafted by a Committee, to formulate the conditions under which youths intending to enter the engineering profession, or train for staff appointments, may be admitted to the Institution. Such students will be styled "Cadet" Associate Members, and in the pamphlet full particulars are given as to their proposed qualifications and privileges. The scheme is intended to fill a gap which now exists at the outset of a youth's career. Details may be obtained from the secretary, Mr. W. A. Tookey, 39, Victoria Street, S.W. 1.

The Control of Coal.—At the London meeting of the Institution of Gas Engineers, recently, Mr. Guy Calthrop, the Coal Controller, gave some account of the operations and plans of the Coal Mines Department.

The object of instituting a control of coal mines, he said, was not to interfere with industry, but, as far as possible, to get all to work together in the interest of the nation in the present crisis. Two of the greatest problems he had to deal with were these:—

1. To secure a reasonable supply of coal for London and the counties of Great Britain which were most remote from the coal fields during the next winter.

2. To help, so far as he could, the railway companies in their present difficulties with regard to transport.

Out of the 600,000 men who were in the railway industry in times of peace 160,000 had joined the Forces, and a very great number of engines and a larger number of wagons had had to be sent to the various Fronts in order to deal with the situation there.

A scheme had now been drawn up to secure that coal should be consumed as near as possible to the point of its output. The scheme as far as they had gone dealt with upwards of 40,000,000 tons of coal per annum, and if they could carry it through they would materially assist the railway companies in the coming winter. Supposing the war were over to-morrow, the transport difficulties of England would not be over at the same time. They would continue through the winter. Our losses in ships were common knowledge, and the transport of coal by ship from Northumberland or Durham to the South of England could not be anything like what it was before the war.—*The Times.*

Suppression of Sparking.—At a recent meeting of the Physical Society of London, a demonstration of a method of preventing sparking at a rapid make and break, which incidentally produces colloidal platinum, was given by Dr. A. Griffiths. The device consists of a series of electrolytic cells placed as a shunt across the spark-gap. The electrodes consist of platinum and the electrolyte of strong sulphuric acid. The cells polarise, and on making the gap an E.M.F. is introduced opposed to the E.M.F. of the battery, so that the current rapidly diminishes, decomposing the liquid and doing chemical work.

Mr. A. Campbell communicated the following remarks:—"Many years ago Helmholtz introduced the use of a condenser, shunted by a suitable resistance, across the spark gap for the purpose of suppressing the spark. More recently a better system was employed by the engineers of the G.P.O., who kindly communicated it to the National Physical Laboratory, where it has been used with the greatest success on all kinds of spark-gaps (from 1 break per second up to 1,000 per second). This consisted in putting the resistance in series with the condenser. By adjusting the value of the resistance to suit the particular circuit it is nearly always possible to suppress the spark. There is no leak across the break, as in the shunt system."

OUR PERSONAL COLUMN.

The Editors invite electrical engineers, whether connected with the technical or the commercial side of the profession and industry, also electric tramway and railway officials, to keep readers of the ELECTRICAL REVIEW *posted as to their movements.*

Central Station Officials.—Stafford T.C. has increased the salary of the manager and engineer of the electricity department, Mr. ROBINS, from £200 to £250 a year, rising to a maximum of £300.

The Rochdale Electricity Committee recommends that the appointments of Mr. WOOD, of Bolton, as consulting engineer, and of Mr. F. H. RUDD, as acting-engineer, be continued for a further three months.

Coventry Electricity Committee has recommended that the salary of Mr. GEO. TOUGH, engineer and manager, be increased from £750 to £900 per annum.

The Cheltenham Council has decided to advance the salary of Mr. BACHE, the borough electrical engineer, from £450 to £550, with a further advance of £50 two years' hence.

The Grimsby Public Lighting Committee recommends that an additional war bonus at the rate of £50 per annum be granted to the deputy electrical engineer (Mr. A. S. CHANNON) during the time he is in charge of the electricity undertaking.

General.—Mr. CONRAD COOKE underwent an operation upon his left eye at a nursing home in London last week. We are pleased to learn that it was quite successful. We hope that the operation that is being performed on the right eye will be equally so.

In the name of the directors of the Musselburgh Electric Tramway Co., wristlet watches were presented to Miss BELL and Miss HALLIDAY for displaying presence of mind in emergency when on duty as drivers of electric cars of the company.

At the annual meeting of Waygood-Otis, Ltd., Mr. H. C. WALKER announced that during the year he had, after 50 years' service, resigned the office of managing director. Mr. D. W. R. Green, at the time of the amalgamation with the Otis Co., was appointed to serve with him as joint managing director. Mr. C. Clarke, for many years the general manager and director of the Otis Co., would in future act with Mr. Green as joint managing director. He (Mr. Walker) would continue to serve as chairman of directors.

Roll of Honour.—LESLIE WILLIAM CASTON, a first-class air mechanic in the R.N.A.S., has been awarded a D.S.M. for gallantry in the North Sea. He was a student at the Wandsworth Technical Institute, and, after being in the service of the General Electric Co., Ltd., he joined the L.G.O. Co., at their Streatham garage.

Lance-Corporal W. H. TOWNLEY, North Staffs. Regiment, who was with Mr. Leonard Vaughan, electrician, of Hanley, has died at the Front from injuries received in an accident.

The Military Medal has been awarded to Corporal G. T. BRADLEY, who was an electrician at Markham Colliery, Staveley.

Temporary Second-Lieutenant FRED. PROUDFOOT, an electrical engineer, son of Mr. Proudfoot, formerly telegraph superintendent at the Carlisle Post Office, has been awarded the Military Cross.

Corporal F. T. MESSAGE, who is in hospital, was employed as an electrician with Mr. Teeton, Hanley.

Corporal W. SCOTT, R.E., who has been awarded the Military Medal, was employed as a foreman in an electrical engineering works in Paisley.

The *Times* states that Sir HENRY NORMAN, who acted as *liasion* officer between the British and French Governments in the matter of war inventions, has been made an Officer of the Legion of Honour.

Private J. M'KINNON, who has died from wounds, was with Messrs. Fraser & Borthwick, electrical engineers, Glasgow.

Second-Lieutenant N. S. SIM, Cameron Highlanders, an electrical engineer, and a B.Sc. in Engineering (Glasgow University), has been awarded the Military Cross.

Private H. S. LANT, North Staffs. Regiment, now presumed to be dead, after being missing for nine months, was on the staff of Messrs. Siemens Bros., Ltd., Stafford.

Private J. W. WALKER, Northumberland Fusiliers, who is reported to have died on April 13th, whilst a prisoner in Germany, had been in the enemy's hands since August 23rd, 1914. He was on the clerical staff of the Phœnix Dynamo Co., Bradford.

Captain R. L. JOHNSON, R.F.A., who was killed on May 26th, was in Australia when war broke out, with the Sydney branch of Messrs. R. Johnson, Clapham & Morris. He was appointed chairman of the company in 1916, on the death of his eldest brother, also in the war.

According to the *National News*, Mr. HERBERT L. COSTA, manager of the building and electrical departments of Harrod's, has been personally decorated with the Cross of Chevalier of the Order of Leopold II by the King of the Belgians, near the firing line, for services rendered in connection with building and engineering operations carried out for the Belgians by his firm.

Sergeant J. H. SIVERS, Royal Fusiliers, who has died of wounds, was an L.C.C. tramway inspector.

Sergeant-Major A. MITCHELL, Rifle Brigade, formerly in the rubber department of the India-Rubber Co., Silvertown, has been awarded the Military Medal. Private L. NORTH, Royal Fusiliers, formerly in the general office of the company, and Gunner T. W. B. PURCHASE, R.F.A., formerly in the cashier and buyer's department of the same company, have both been wounded in France.

Obituary.—MR. G. D. SEATON.—We regret to record the death, which occurred on June 21st, at Fallowfield, of Mr. Gervase D. Seaton, son of Prebendary Seaton, Vicar of Goodrich. Mr. Seaton, who was 49 years of age, was a familiar figure at conventions of the I.M.E.A. and other meetings, where he was always most excellent company, and a speaker who had the gift of contributing both profitably and humorously to a discussion. He was an expert in the turbine world, and at different periods he had represented in Manchester Messrs. Willans & Robinson, Ltd., the British Westinghouse Co., and latterly Messrs. Richardsons, Westgarth and Co., Ltd. He had been prominently identified with the Manchester Engineers' Club from the beginning.

MRS. TOUGH.—We regret to state that Mrs. Tough, wife of Mr. G. Tough, manager of the Corporation electricity works at Coventry, passed away suddenly last Sunday week while at church.

Will.—The late Sir BENJAMIN C. BROWN, of Newcastle-on-Tyne, left £77,415.

NEW COMPANIES REGISTERED.

British Chamber of Commerce in Brazil (147,749).—(The word "Limited" is omitted from the title by licence of the Board of Trade.) Registered June 16th, by Corbould, Rigby & Co., 1, Henrietta Street, Cavendish Square, W., as an association limited by guarantee, not formed for purpose of profit. For the purpose of registration the number of members is declared not to exceed 1,000, with power to register an increase at any time. In the event of winding up every member is liable for not more than £5 towards the satisfaction of the liabilities of the Chamber, the costs of the winding up, and the adjustment of the rights of contributories among themselves. The Chamber is to consist of British incorporated companies, British merchants, traders, representatives, agents, and professional and business men working or trading in or with Brazil. ("British," as regard individuals, means that such individuals are British subjects. British companies may only be represented at meetings of the Chamber or in correspondence therewith by British subjects.) The objects are to promote and protect British interests in Brazil, to collect and disseminate information, &c. The first directors are: F. W. Perkins (Lamport & Holt), F. Dodd, E. P. Matheson, C. D. Simmons, A. J. Cruickshank, H. L. Wheatley, J. M. Glen, J. F. Shalders, F. H. Walter, J. H. Moorby, H. O Robinson, L. E. Sancean, C. F. Cruickshank (Norton, Megaw & Co., Ltd.), S. L. F. McLaughlan, H. W. Sloper, W. J. Robson, A. H. Roberts, H. C. G. Pullen (Davidson, Pullen & Co.), J. P. Wileman, E. L. Harrison, and R. Whichello, all of Rio de Janeiro. There is to be a "Foundation Fund," the contributors to which are to be called "Founders," but the title of "Founder" carries no privileges. The first trustees of such fund are F. S. Pryor (manager of London & Brazilian Bank, Ltd., Rio de Janeiro), A. Weigall (manager, Rio de Janeiro Flour Mills and Granaries, Ltd., Rio de Janeiro), and A. Mackenzie (president, Brazilian Traction, Light & Power Co., Rio de Janeiro). Each of the following trades is to be represented by at least one member on the Council, viz.: Coffee, shipping, banking, importing, exporting, textiles, coal and oil fuel, machinery, mining, insurance, engineering and railways. The Council may appoint subcommittees to represent the following sections, viz.: (1) Machinery, (2) banks and financial houses, (3) coal and oil fuel, (4) general exporters, (5) textiles, (6) engineering and contracting, (7) railways and tramways, (8) hardware and lumber, (9) insurance, (10) coffee exporters, (11) general importers, (12) refrigerating companies, (13) shipping, (14) mining. These may be added to. Registered office: 1, Henrietta Street, Cavendish Square, W.

James & Shakspeare, Ltd. (147,797).—Private company. Registered June 22nd. Capital, £17,000 in £1 shares. To take over the business of metal brokers and merchants formerly carried on at 1, Metal Exchange Buildings, E.C., and elsewhere, as James & Shakspeare. Agreement with H. H. James and A. F. B. James. The subscribers (each with one share) are: R. H. H. James, 42, Pembroke Square, Kensington, W., gentleman; Mrs. E. H. Christian, 91, Barkston Gardens, Kensington. The first directors are: A. F. B. James, H. H. James, and R. H. H. James. The two first-named may retain office while holding 500 shares. Until otherwise resolved by the company, no person may be a director who is not a lineal descendant of the late K. H. James. Registered office: 1, Metal Exchange Buildings, E.C.

OFFICIAL RETURNS OF ELECTRICAL COMPANIES.

James Clay (Wellington), Ltd.—Equitable mortgage to secure all sums due or to become due to bankers charged on freehold hereditaments and premises in Foundry Lane, Wellington, Salop. Holders: Barclay's Bank, Ltd., Wellington.

Phonopore Construction Co., Ltd.—Particulars of £2,000 debentures created May 15th, 1917, filed pursuant to Section 93 (3) of the Companies (Consolidation) Act, 1908, the whole amount being now issued. Property charged: The company's undertaking and property, present and future, including uncalled capital. No trustees.

Hexham & District Electric Supply Co., Ltd.—Particulars of £5,000 debentures created November 6th, 1913, filed pursuant to Section 93 (3) of the Companies (Consolidation) Act, 1908, the amount of the present issue being £4,300. Property charged: The company's undertaking and property, present and future, including uncalled capital. No trustees.

Brilliant Arc Lamp & Engineering Co., Ltd.—Memorandum of satisfaction in full on May 12th, 1917, of charge dated December 7th, 1916, securing all moneys due or to become due thereunder.

Thermo Electric Ore Reduction Corporation, Ltd.—Particulars of £100,000 debentures created June 14th, 1917, filed pursuant to Section 93 (3) of the Companies (Consolidation) Act, 1908, the whole amount being now issued. Property charged: The company's undertaking and property, present and future, including uncalled capital. No trustees.

Enfield Electric Cable Manufacturing Co., Ltd.—Debenture dated June 8th, 1917, to secure £35,000 charged on the company's undertaking and property, present and future, including uncalled capital, with a specific charge on land at Brimsdown, Enfield, and the factory and other buildings thereon, &c. Holders: London County & Westminster Bank.

A memorandum of satisfaction in full on June 8th, 1917, of mortgage dated December 31st, 1915, securing £10,000, to London County & Westminster Bank.

Faraday & Son, Ltd.—Particulars of £5,000 debentures created January 6th, 1917, filed pursuant to Section 93 (3) of the Companies (Consolidation) Act, 1908, the whole amount being now issued. Property charged: The company's undertaking and property, present and future, including uncalled capital. No trustees.

James Keith & Blackman Co., Ltd.—A memorandum of satisfaction in full on May 15th, 1917, of second debentures dated January 6th, 1913, securing £550, has been filed.

U.S. Light & Heat Corporation (1,583F).—Particulars filed June 20th, 1917. Registered in U.S.A. June 30th, 1915. Capital stock, 7,000,000 dols. (3,000,000 dols. preferred and 4,000,000 dols. common stock). Principal office: City of Niagara Falls, U.S.A. British address: 17, Conduit Street, W.1, where H. H. Powell is authorised to accept service. Directors: J. A. Smith, A. H. Ackermann, R. C. Caples, H. W. Farnum, E. H. Gold, E. K. Gordon, C. L. Lane, J. A. Roberts, B. J. O'Reilly, and G. C. Shephard, all of U.S.A.

Bude Electric Supply Co., Ltd. (95,137).—Capital, £15,000 in £1 shares. Return dated April 28th, 1917. 10,000 shares taken up; £10,000 paid. Mortgages and charges: £2,500 mortgage debentures.

Cable Accessories Co., Ltd. (93,345).—Capital, £50,000 in 40,000 ord. and 10,000 pref. shares of £1 each. Return dated May 21st, 1917. 31,999 ord. and 5,640 pref. shares taken up; £1 per share called up on 21,678 ord. and 5,640 pref., and 15s. per share on 10,321 pref.; £32,008 15s. paid; £3,050 considered as paid. Mortgages and charges: Nil. A further 3,177 ord. and 400 pref. were allotted, payable in cash on May 31st.

CITY NOTES.

British Electric Traction Co., Ltd.

The annual meeting was held on Friday last at the Holborn Restaurant. Mr. EMILE GARCKE, who presided, said that the stupendous expenditure by the nation and the employment of so many hands, both male and female, in the production of munitions of war, combined with restricted railway facilities, had had the effect upon their receipts akin to that which would be produced by great trade prosperity. The value of the increased receipts must, however, be weighed against the increased expenses, and then it was seen that the balance of profits was not proportionate to the increased work done. The prosperity was abnormal in character, and was accompanied by neutralising conditions likewise abnormal. These adverse conditions were both numerous and multiform. Prices generally, with the remarkable exception of tramway fares, had more than doubled since the beginning of the war, and were still rising. Wages had gone up considerably. Taxation had increased; restrictions on all forms of enterprise other than war work were enforced by all sorts of regulations, by dearth of labour and executive staffs, by prohibition against investment of capital other than for national purposes, and by feeling of uncertainty in regard to the future. The conditions applied generally to the industries in which they were engaged, viz., tramways, light railways, omnibus services, electric light and power supply, manufacture, and, he must not omit to say, finance, for they had in their group an investment company with investments of over £500,000. The figures he would give would not include the London group of companies, which stood in a class by themselves. In the tramway and light railway department receipts had increased by £90,000 and expenses by about £52,000. The higher expenses were mainly represented by increased wages paid. In the omnibus department the receipts showed an increase of £97,000, and the expenses an increase of about £91,000. This department was suffering very severely under war conditions. Their automobile department, from which they expected gratifying auxiliary profits, was for the present to a large extent in a very disturbed state, and they feared that the profits for the current year would not come up to last year's figures. In the electricity supply department the receipts had increased by £88,000, and the costs of generation by about £77,000. They had nearly doubled the output of electricity for power purposes, chiefly supplying munition factories and other works engaged on Government orders. On the other hand, the sale of electricity for private lighting had fallen off. The cost of fuel had increased enormously, though differently according to the location of the power houses, and they had not been able, for various reasons, to obtain corresponding increases of price. In the manufacturing department, the Brush Co. had been fully occupied in making aeroplanes, seaplanes, and other machines. The company had also established the superiority of the Ljungström turbine, and valuable orders were being received for this machine, which, however, could not be executed because of the necessary Government restrictions on the use of materials for other than war purposes. The Brush Co. was now making moderate profits; but it had not resumed the payment of dividends, because under present conditions it was deemed better to strengthen the finances. Lastly, with regard to their investment company; that company had not, of course, increased its distribution of dividend, but it was satisfactorily holding its own in view of the

heavy market depreciation of all securities. The aggregate increase of revenue in all departments of their public service undertakings had, therefore, been about £275,000, while the aggregate increase of the expenses was about £223,000. The aggregate receipts of their tramway, omnibus, and electricity supply undertakings for the past year had been £1,768,000, and the aggregate expenses had been £1,150,000. The aggregate surplus had been £618,000, compared with £566,000 in 1915, or about £52,000 more than in 1915. On the whole, therefore, the associated companies had done better during the past year. They showed larger profits, though the increase was not commensurate with the larger volume of work they had done. Those larger profits had in most cases been added to reserves, partly because renewals and replacements had been postponed, and partly because of the uncertain outlook, and only in a few cases had the dividends been slightly increased. Putting it shortly, the majority of companies had strengthened their finances by not increasing their dividends. Those figures did not include the results of the London companies. Those were summarised in the dividend they received on their shares in the London and Suburban Co., and that dividend had remained at the same rate in 1916 as in 1915. The conditions due to the war had adversely and seriously affected the prosperity of all the companies in which the London and Suburban Traction Co. was interested. Wages had increased considerably, and the higher expenses generally had more than swallowed up the increased receipts. The London United Tramways Co., which was included in the group, had suffered most. The B.E.T. Co. had nothing to do with the promotion and management of the London United Tramways. The majority of the ordinary shares were held by the Underground Electric Railways Co. of London, and the Tramway Co. was brought into the combination formed by the London and Suburban Co. in 1913 with a view to putting an end to the competition between the Metropolitan Tramways and the L.G.O. Co. The elimination of competition had not been carried out to the extent anticipated, but the chairman of the London and Suburban Co., at the general meeting last week, stated that discussions between that company and the Underground Co. were taking place with a view to the better co-ordination of traffic facilities in Greater London and in regard to other questions, and that there was hope that those negotiations would lead to better understandings and result in improved profits to the London and Suburban Co. The accounts of the B.E.T. Co. showed a net profit of £200,000, against £209,000 for the preceding year. In 1916 they added £20,000 to reserve. He explained last year that that represented two years' contributions; that they would not advise making any annual contribution fixed and unalterable for all time, but that the circumstances of each year should be considered. The contribution of £15,000 this year must not, therefore, be regarded as a descent to a lower level of prudence. As a matter of fact, the reserves were quite ample, having regard to the writing off that had taken place and to the substantial reserves made by the underlying companies. At the end of 1915 those companies, again excluding the London companies, had total reserves of £1,300,000, and during the past year they added £243,000, making a total reserve of over 1¼ million, to which must be added the reserve and the carry-forward of that company—a further half million. The maximum fares which could be demanded on tramways or light railways were limited by the Acts and Orders, and could not be increased without Parliamentary sanction. Those restrictions might have been reasonable in the latter part of the last century, when the powers were obtained; but in view of the changed conditions which now obtained, and must be looked for in the future, it was only equitable that the statutory restrictions should be reviewed by the Board of Trade or other Government Department, and steps had been taken by the Tramways and Light Railways Association to have this question considered by the authorities. The electrical industry was hoping that the Government would do something to remove some of the disabilities which restricted the best development of the industry. If the matter was looked at from scientific and economic points of view, and not merely politically, the importance to the nation of allowing the free development of the electrical industry must be recognised. For 34 years he had made fruitless exertions to obtain elementary justice and a modicum of encouragement for an industry which was hourly proving its great value to the community. He had never abandoned hope of ultimate success—a hope which recent events had further stimulated. The shaking up produced by three years of war had done more than 30 years of peaceful agitation to secure recognition of the view that the electrical industry deserved to be freed from the shackles which impeded its progress. In regard to the Labour situation, a reversion to the pre-war methods of restrictive output was incompatible with the industrial conditions and needs of the community, which required that every member of the community should work harder, consume less, and save more. But the employers and the whole nation were pledged to restore the Trade Union regulations after the war. The representatives of Labour, however, recognised—as they all did—that this was impossible. There was, therefore, a common basis for the establishment of a new order of relations between Capital and Labour, and it would tax to the utmost the highest statesmanship to find an equitable solution of the difficulty. They could all assist in this effort by unbiassed discussion of the problems in a spirit of fairness which recognised on the one hand the just claims of labour for a better standard of living, and, on the other hand, the economic necessity of adequately rewarding those who saved a part of their income and did not spend all they received. There could be no doubt that if everyone did his best to increase the output and improve the quality of work, the result would be that all reasonable demands of labour could be satisfied without causing any diminution in the availability of capital. In regard to the metric system, in his view the inconvenience of making the change would be greatly outweighed by the advantages that would follow the adoption of the decimal system. Among those advantages, not the least would be th improvement it would effect in our commercial relations with other nations. In this connection it was gratifying to learn that steps were being taken to increase the efficiency of the British Consular services abroad with a view to the representatives of the Empire acting as antennæ to the nerve centres of the trade and commerce of the Empire. But probably the most far-reaching reforms they would see carried in the near future were due to the recognition of the fact, even by confirmed Free Traders, that after the war this country would not be able to rely mainly upon its financial strength and its shipping supremacy in the trade and commerce of the world, but that it must have a protected home market for its manufactures as a base from which, in conjunction with its Colonies, it could keep a hold on international markets and, incidentally, help to raise a part of the huge revenue which would be required for interest and redemption of war indebtedness. A continued policy of direct taxation to provide the major part of this revenue, as at present, would defeat its own object, for it would discourage the accumulation of capital, which was indispensable for new enterprise. From this point of view it was to be hoped that the Excess Profits Tax would be withdrawn at the earliest possible date, for the excessiveness applied now to the tax rather than to the profits, and would deter enterprise and, therefore, check capital creation. The excessive taxation of profits would after the war, he feared, find expression in unemployment. That brought him to the last point he wished to mention, and that was the importance of organising their industrial system so that manufacturers and others could obtain for the initiation of enterprises the use of capital not only by means of temporary banking facilities or public issues, but by concentrated and reasoned capitalistic support. The wonderful cheque system which had been developed by our big banking institutions had created a credit structure which had met with admiration throughout the world. But the manufacturer, contractor, and, still more, the inventor, needed more than a few months' credit on immediately realisable security, for it was not always practicable or desirable to make permanent increases of capital in the form of debentures or shares. Public issues of industrial capital were periodic, and even epidemic, in occurrence, and capricious in reception. They depended very often upon public fancy, and not on intrinsic merits, conditions which were largely responsible for over-capitalisation and for the promotion of undesirable companies. The formation of the British Trade Corporation, the suggested co-operation between the large trust companies, the activities of the recently-formed Federation of British Industries, were indications that wider views and better methods would assert themselves for the solution of these industrial problems. As regarded the prospects of their companies in the immediate future, all he could say was that anyone in the midst of present complex situations, and impressed with the uncertainty of events, would be unwise to indulge in prophecy of a definite kind.

Mr. C. G. TEGETMEIER seconded the motion, which, after a short discussion, was unanimously adopted.

Marconi International Marine Communication Co., Ltd.

The report for 1916 states that the business continues to show substantial expansion. Gross revenue, £270,181—an increase of £61,282, derived almost entirely from the subsidies from additional contracts. Restrictions in respect of private messages have continued. Net profit £96,748, after deducting £31,790 for depreciation and debenture interest; this compares with £63,630 for 1915. Amount standing at profit and loss account £123,744, including £26,996 brought forward. Losses sustained through attacks upon mercantile fleet have been debited to profit and loss. Total number of public telegraph stations owned and worked by the company on the high seas increased from 1,008 to 1,472. The organisation of the company and its associations, with a total of 3,000 mercantile vessels fitted with Marconi telegraph stations, has continued to render inestimable service. A final dividend of 10 per cent. is recommended, making 15 per cent. for the year. There is appended to the report a list of the company's sea-going telegraph staff who have given their lives in the national cause. The Amalgamated Wireless (Australasia), Ltd., has paid 5 per cent. The offer to shareholders last November of the remainder of the authorised capital at a premium of 15s. per share was largely oversubscribed. The capital was required in consequence of capital expenditure upon providing installations for the increased number of ship stations. Since the end of the financial year the business has increased even more rapidly. Orders in hand are so large that additional capital is essential. An extra-

ordinary general meeting is therefore convened for increasing the capital to £600,000, part of which increase will be issued as soon as possible.

Singapore Electric Tramways, Ltd.

Sir F. A. Swettenham presided at the annual meeting on June 19th. He said that the traffic receipts were better by £7,592. The sales of energy were £13,530, a decrease of £259, due not to decreased demand, but to the automatic reduction of prices, as the supply increased, under the renewed contract with the municipality. The demand was still increasing, but they did not think that in the next accounts they would show a smaller amount for a larger supply, but the Municipality was treating them with less than justice in holding them to a scale of rates fixed without regard to war prices. The cost of power had advanced from £12,300 to £17,000; of the difference, £4,700, fuel represented £3,400. For the period 1912-1915 the average cost of coal in Singapore was $9.93; in February this year it was $22.70, and they were not sure that top prices had been reached. Having regard to these figures, the action of the Municipality was the more incomprehensible, especially as the Municipality had advanced the rates for gas, of which it was the supplier. In many cases supplies of materials were costing twice pre-war figures. They had a very large deferred commitment in the track renewal which had to be faced. They desired to distribute profits when available, and intended shortly to declare an interim dividend of 5 per cent., which would reduce the carry-forward to £2,946. Mr. J. H. Garrett had resigned his position as general manager after 11 years. His chief assistant, Mr. H. G. Wightwick, would succeed him.

Aluminium Corpn., Ltd.

For 1916 the net profit, after providing for debenture interest, &c., was £46,897, plus £4,560 brought forward. After paying the 7 per cent. preference dividend, £15,678, in December last, the balance is £35,779, the appropriation of which will be subject to the liability for war taxation under the Finance and Munitions Acts. The distribution on the preference shares last Christmas was made in view of the trading results then ascertained, but as it has been impossible to ascertain, in time for the annual meeting, the amount payable as war taxation, a further dividend cannot be recommended, and the above balance is to be carried forward. Depreciation upon buildings, plant and machinery will be considered when the war taxation question is settled. Further important necessary constructive works, including a bridge over the Conway River, have been proceeded with, and the main line of the L. & N.-W. Rly. has been connected to the works by a siding. The Cowlyd Water Board's Bill has been passed through Parliament, and the necessary preliminary work for the erection of the dam across the Cowlyd Valley is well in hand. Annual meeting: June 27th.

French Electrical Companies.

The Société Electro-Metallurgique Française, reports net profits amounting to £293,000 for 1916, as compared with £252,000 in the previous year. A dividend at the rate of £4 16s. per share has been declared, this comparing with £3 in 1915.

The Société des Cables Electriques (système Berthoud, Borel et Cie.) reports net profits amounting to £18,200 in 1916, as compared with £7,800 in the previous 12 months. The directors recommend a dividend of £1 12s. per share.

The Société d'Electro-Chimie de Bozel, after apportioning £37,000 to extraordinary depreciation in 1916, reports net profits of £43,000, as against £33,000 in the preceding year. It is intended to pay a dividend of 16s. per share, as compared with 14s. 5d. in 1915.

The Société Electro-Metallurgique (Procédé Paul Girod) announces that the net profits earned in 1916 will allow of the distribution of £2 per share. A proposal for the amalgamation of the two Girod companies will be submitted at a forthcoming meeting.

The Société Electro-Chimique du Giffre reports that the manufactures at the works at Giffre, particularly the iron alloys, were in active demand in 1916. The net profits realised amounted to £27,000, as compared with £23,000 in 1915, and a dividend of £2 8s. per share has been declared.

The report of the *Chemin de Fer Electrique Souterrain Nord-Sud de Paris* states that 1916 was characterised by the opening to traffic of the extension of the principal line between the Place Jules-Joffrin and the Porte de la Chapelle, so that the length of line worked increased from 8.76 miles to 9.92 miles. Including various receipts, the total income amounted to £484,000, as compared with £383,000 in the previous year. Such an augmentation in normal times would have been an indication of great prosperity, but owing to the coal crisis and the dearness of other raw materials, the working expenses advanced to such a large extent as to almost entirely absorb the growth in the receipts, and the ratio of expenses to receipts rose from 48.98 per cent. in 1915 to 56.79 per cent. last year. Notwithstanding this, the payments made to the City of Paris under the contract increased by £4,700 to £34,600. The directors had applied for a revision of the terms of the concession, but no definite decision had yet been reached. The accounts closed with a credit balance of £28,000, as against £15,000 in 1915, and the former has been transferred to the provisional account, which now amounts to £97,000.

The Compagnie Française pour l'Exploitation des Procédés Thomson-Houston reports gross profits of £422,000 for 1916, or £121,000 in excess of the preceding year, and net profits of £272,000, or £80,000 more than in 1915. A dividend at the rate of 7 per cent. has been declared, being equal to the rates paid in the years immediately previous to the war, on the ordinary share capital of £2,400,000. The directors report that since 1909 the sum of £360,000 has been expended on extensions of the old, and the erection of new, works. During 1916 the company participated in certain financial operations under the auspices of the Government for the purpose of opening large long-term credits in the United States and Switzerland. In addition, the company concluded on its own individual account a similar arrangement with the parent company in the United States—the General Electric Co. It was thus possible to avoid in part the financial burden which would have arisen for the company and the money market in the settlement of purchases of raw and other materials in the United States. This was an important service for which the company was indebted to its American friends—a fresh reason for the gratitude which the directors expressed a year ago. The terms of the agreement concluded with them 25 years ago had been applied not only with strict loyalty, but also with the most perfect spirit of liberality, co-operation, and friendship. After dealing in detail in the customary manner with the course followed by each of the company's departments in the past year, the report mentions that the company has given its adhesion to the interesting organisation established by the Union Nationale Intersyndicate des Marques Collectives, and has adopted for all the company's manufactures the general mark of U.N.I.S., which the public must learn to know and ask for on all the products purchased, because it is a guarantee of the exclusively French origin of the manufactures. The report proceeds to refer to the undertakings and installations entrusted to the works, and states that among the principal orders received were those for an alternator of 8,000 KW. for the Ventavon Works, a turbo-alternator of 10,000 KW. for Baku, and four transformers of 3,200 KW. each, whilst the order for the Southern Railway Co. has been re-arranged, and now comprises the supply of seven alternators of 4,375 KW. each, and transformers for 120,000 volts, together with two sets of generators and exciters and switchboards. Particulars are also given of the many undertakings in which the company holds a financial interest, and the report concludes by stating that the company is making preparations for the future commercial struggle, which will be longer than the present war, and not less implacable.

German Electrical Companies.

The Land und Seekabel Werke A.G., of Cologne, records net profits of £37,000 for 1916, as compared with £38,000 in the previous year. A dividend of 12 per cent. is recommended, as against 11 per cent. in the preceding year.

The Welter Elektrizitats und Hebezeug Werke A.G., of Cologne-Zollstock, reports a considerably greater turnover in 1916, and net profits of £3,360, as compared with £3,330 in 1915. It is intended to pay 6 per cent., as against 5 per cent. in 1915.

The net profits of the *Elektrizitats Gesellschaft-vorm. W. Lahmeyer & Co., of Frankfort-on-Main*, are reported to amount to £130,000, as contrasted with £103,000 in 1915. It is proposed to pay a dividend of 8 per cent., as against 7 per cent. in the preceding year.

The Treuhand Bank fur die Elektrische Industrie A.G., of Berlin, records receipts of £45,000 from investments in 1916, as compared with £4,300 in the previous 12 months. Including the balance forward, the net profits are £40,000, as against £1,900 in 1915. It is intended to pay 4 per cent. on the paid-up capital of £500,000, this contrasting with no distribution in the preceding year.

The Electro Treuhand A.G., of Hamburg, which is one of the electrical banks, received £41,250 as dividend on the Hamburg Elevated Railway shares in 1916, and £17,500 from interest, being approximately the same as in the previous year. After meeting interest on loans, the accounts indicate net profits of £31,900, as against £29,000 in 1915, and the dividend is at the rate of 5½ per cent., as in the preceding year.

The directors of the *Julius Pintsch A.G., of Berlin*, report a decrease in the manufacturing profits from £550,000 in 1915 to £494,000 last year, the diminution being attributed to the growth in working expenses. As the Russian subsidiary had been compulsorily liquidated, the company's foreign interests had been fully written off, the sum of £152,000 having been devoted to this purpose in 1915. As no similar depreciation had to be made in 1916, the net profits were £93,000, as against £73,000 in 1915, and the dividend also rises from 8 in 1915 to 10 per cent. last year.

The report of *Gebruder Korting A.G., of Linden*, which company is associated with the A.E.G., states that war requirements were considerable, and the turnover both in Germany and Austria-Hungary largely increased. As any information concerning the company's subsidiaries in enemy countries is still lacking, these have been left out of consideration in the preparation of the balance sheet. The amount set aside for depreciation is £75,000, as against

£64,000 in 1915, leaving net profits of £113,000 and £112,000 in the two years respectively. The dividend is 10 per cent., as in 1915, on share capital of £950,000, whereas no distribution was made in 1914.

The accounts of the *Felten und Guilleaume Carlswerk A.G., of Frankfort-on-Main*, after allocating £156,000 to depreciation in 1916, as compared with £149,000 in the preceding year, show net profits of £415,000, as against £353,000. The directors recommend a dividend of 12 per cent., as contrasted with 11 per cent. in 1915. The annual report merely states that it was possible for the company to increase the capacity of the works and obtain favourable results, and that the augmentation in the ordinary share capital from £2,750,000 to £3,000,000, which was decided upon in 1915, had been carried out in the meantime.

The Accumulatoren Fabrik A.G., of Berlin and Hagen, reports a not inconsiderable increase in the turnover in 1916, and states that the company's interests in the Societa Italiana Accumulatori Elettrici, of Milan, were disposed of shortly before Italy entered the war. No reliable information was available concerning the other undertakings in enemy countries, but the cautious valuation of these concerns excluded any risk of loss. The accounts exhibit gross profits of £223,000, as against £176,000 in 1915, and net profits of £193,000 and £138,000 in the two years respectively. It is proposed to pay a dividend of 25 per cent. on the ordinary share capital of £600,000, this comparing with 20 per cent. in 1915, 18 per cent. in 1914, and 20 per cent. in 1913.

The directors of *Hartmann & Braun A.G., of Frankfort-on-Main*, report better results for 1916, notwithstanding the difficulties in obtaining raw materials and the increase in wages. As gross profits, the accounts show the sum of £142,000, as compared with £127,000 in 1915, and net profits of £49,000, as against £38,000 on ordinary share capital of £85,000. The dividend is at the rate of 14 per cent., and compares with 12 per cent. in 1915, 8 per cent. in 1914, and 10 per cent. in 1913. It has been decided to increase the capital by £20,000 by the issue of 400 new shares, most of which are offered to present proprietors, with a bonus from the net profits, which raises the dividend for 1916 to 34 per cent.

The Deutsch-Ueberseeische Elektrizitats Gesellschaft, of Berlin, whose business is located principally at Buenos Aires and other cities in South America, states that a moderate increase in the receipts of all the undertakings took place in 1916, as compared with the preceding year. On the other hand, the effects of the war on the working expenses were felt to a substantially greater extent, particularly in regard to the constantly rising prices for fuel and other materials, and in Buenos Aires alone it was estimated that the extra expenditure for fuel amounted to £50,000 last year, of which only a portion could be recovered through higher prices for energy. The gross profits amount to £1,173,000, as against £1,520,000 in 1915, and £206,000 has been placed to depreciation account, as contrasted with £371,000 in the previous year. Out of the net profits of £539,000, as compared with £734,000 in 1915, the directors propose a dividend of 7 per cent. on the ordinary share capital of £6,000,000, this contrasting with 10 per cent. in the preceding year.

The Gesellschaft fur Elektrische Unternehmungen, of Berlin, states that the continuation of the war again reacted unfavourably upon the undertaking. On the one hand, the inland tramways to some extent yielded better results owing to the lack of other means of transport and the reduced mileage run, while, on the other, the electricity works and overland stations greatly suffered from the introduction of summer time, the earlier closing of shops, and the decrease in the consumption for tramway purposes and the restrictions in public lighting, together with the considerable advance in working expenses. An increase in the charges for energy was not made in general. The receipts from dividends and interest, which declined by £90,000 in 1915, increased by £11,000 in 1916, but the profits realised on the sale of investments receded by £10,000. The net profits are returned at £185,000, as compared with £216,000 in 1915, and the dividend on the ordinary share capital of £3,000,000 is 5 per cent., as contrasted with 6 per cent. in 1915 and 1914, and 10 per cent. in 1913.

German-Netherlands Telegraph Co.—The directors of the Deutsch-Niederlandische Telegraphen Gesellschaft A.G., of Cologne, state that, in so far as they are informed, no change took place in the conditions of the company's stations in the Far East in 1916, and nothing was known as to the condition of the station at Yap. It was also impossible to form an opinion as to how far the station at Shanghai had been affected through the rupture of China's diplomatic relations with Germany. The cable from Yap to Shanghai had been interrupted since July, 1916. The other cables were in good condition, according to the results of tests made to January, 1916. Concerning the German South Sea Wireless Telegraph Co., the report states that the latter had not published accounts for 1915-16, so that the former received no dividend on its investment of £32,100. The total receipts of the German Netherlands Co. are reported to have amounted to £96,000, as compared with £100,000 in 1915, and the net profits are £25,000, as against £41,000 in the two years respectively. It is proposed to pay a dividend of 6 per cent. on the ordinary share capital of £350,000, being the same rate as in the previous year.

The report of the directors of the *Deutsch-Atlantische Telegraphen Gesellschaft, of Cologne*, states that it cannot yet be seen when the company will be able to repair the severed cables and resume working. After the entrance of Portugal into the war, the Portuguese Government placed under supervision the property of the company at Horta, including the station equipment, the land cables, and the officials' houses. On the other hand, no change had taken place at the Vigo (Spain) station. The North German Sea Cable Works, in which the company is interested, paid a dividend of 4 per cent. for 1916, but the proceeds would only be brought into the latter's accounts for 1917. The accounts show a loss of £24,000 for 1916, as compared with a loss of £26,000 in the previous year; but by drawing £75,000 from the special reserve fund, as against £100,000 in 1915, there remains available a balance of £50,000, as contrasted with £72,000 in the preceding year. This will permit of the distribution of 4 per cent. on the ordinary share capital of £1,200,000, and compares with 6 per cent. in 1915, 6½ per cent. in 1914, and 7½ per cent. in 1913.

Southern Brazil Electric Co., Ltd.—Mr. H. E. Tootal, presiding at the annual meeting on June 21st, expressed admiration at the action of Brazil in breaking off relations with Germany. German interests in the Republic were active and powerful, and before the war the Germans were fast acquiring in some parts of the country a preponderating share of various branches of foreign trade. After referring to the fair increases which had taken place in the various branches of the company's services, and to the prosperity of the State of Sao Paulo, the speaker mentioned the marked rise in the value of the milreis (13¾d. now), an appreciation of 14 per cent. since the accounts were closed last December. He hesitated to express any opinion as to the course it was likely to follow in the near future, but should the improvement be maintained, it would, of course, favourably affect the returns for the current year.

Imperial Tramways Co., Ltd.—The available balance for 1916 is £23,040. After paying the debenture interest and preference divided, 2 per cent., less tax, is payable on the ordinary shares, leaving £124 to carry forward. The Middlesbrough, Stockton and Thornby electric tramways showed £70,223 gross receipts, an increase of £3,694. The passengers carried increased by 551,275. Net profit £14,229, as against £15,432 for 1915. Both the tramway and motor-bus services had to be further curtailed, owing to the demands on the staff for military service and to the restriction of petrol supplies, but the facilities for munition workers had been fully maintained. The Imperial Co. holds 125,000 preference and £118,382 ordinary shares in the London & Suburban Traction Co., Ltd., which has paid the full dividend on the preference, but none on the ordinary for the year.

Victoria Falls & Transvaal Power Co., Ltd.—The directors have declared the following dividends:—Preference shares, final dividend of 4 per cent., less income-tax, making 10 per cent. for the year 1916. Preference shares, a dividend at the rate of 6 per cent. per annum, less income-tax, in respect of the six months to June 30th. Ordinary shares, a dividend of 5 per cent., less income-tax, for the year 1916.

Globe Telegraph & Trust Co., Ltd.—Final dividends of 3s. per share, less income-tax, on the preference shares, 8s. per share, free of income-tax, on the ordinary shares, making, with previous distributions, 6 per cent. for the year, less tax, on the preference shares and 7 per cent., free of tax, on the ordinary shares. Net revenue after deducting expenses, £226,623, plus £36,849 brought forward.

Cape Asbestos Co., Ltd.—During 1916 the turnover showed expansion, but the costs of labour, materials, and freight increased seriously. After putting £5,000 to reserve and providing for excess profits, 2½ per cent. is to be paid on the ordinary, free of income-tax, and an equivalent amount on the preference shares, and £5,748 is to be carried forward.

United Electric Tramways of Monte Video, Ltd.—After paying the preference dividend, £15,000 is put to renewals and contingencies, £3,921 to debenture stock redemption, £2,500 to share capital redemption, and £12,814 is to be carried forward.

National Electric Supply Co., Ltd.—Interim dividend, 5 per cent. per annum, less tax, on the ordinary shares for the past half-year.

O. C. Hawkes, Ltd.—Interim dividend, 5 per cent. per annum, less tax, for the half-year, on the ordinary shares.

Eastern Extension, &c., Telegraph Co., Ltd.—Interim dividend for the quarter to March 31st of 3s. per share, free of tax.

Eastern Telegraph Co., Ltd.—First quarterly interim dividend of 1¼ per cent. on the ordinary stock, free of income-tax.

Edgar Allen & Co., Ltd.—Dividend, 10 per cent. for the year and a bonus of 1s. 6d. per share, making 17½ per cent. £25,000 has been placed to reserve.

Arbroath Electric Light & Power Co., Ltd.—Mr. S. RENNY, presiding at the annual meeting, said that they were putting to reserve and renewals £1,000, and paying a dividend of 4 per cent., less income-tax, on the ordinary shares. Steady and satisfactory progress was being made. But for the war they might have paid a record dividend. The entire withdrawal of street lighting meant a considerable loss.

Ruston Proctor & Co., Ltd.—Dividend on the ordinary shares, 8 per cent. for the year, and a bonus of 2 per cent., both subject to income-tax. To reserve, £45,000; forward, £19,600.

J. G. White & Co., Ltd.—Net profit, £18,739—a slight improvement. £34,940 brought forward. Dividend, 6 per cent. per annum on ordinary shares, less income-tax. Forward, £41,679.

J. Stone & Co., Ltd.—Dividend, 10 per cent. per annum, and a bonus of 6 per cent. £100,000 to reserve, and £142,968 forward. The large allocation to reserve is in view of further riverside extensions.

Montreal Light, Heat & Power Co.—Dividend, 2 per cent. for the quarter to July 31st.

STOCKS AND SHARES.

TUESDAY EVENING.

THE partial lull which has taken place on the Western front finds full reflection in Stock Exchange markets in this country. Some of the provincial centres are busy; but so far as London is concerned, investment orders once more show a dwindling tendency. Prices, nevertheless, are well maintained; and some of the recent reports in the industrial market are sufficiently good to have caused big rises in the prices of the shares affected.

Railway stocks are better, too, more particularly those of the companies going North. The reasons for the better tone are the advent of the half-yearly dividends and the official statement that there is no foundation for the rumour that railway fares are to be increased. The report as to restricting the mileage of each traveller has been traversed; but if it should turn out ultimately to be true, the benefit will surely be felt by tube railways and those working within a narrow radius from the Metropolis and other cities. At the moment, steam stocks are good at the expense of the Undergrounds: Incomes fell a point to 83, and Metropolitans are ¾ lower.

Electric lighting shares are practically unchanged, making the second week in succession when there have been no alterations to record in quotations. The market is watching with keen interest the scheme for the division of the whole country into definite areas for the production of electricity. The Secretary to the Board of Trade has announced that no report has yet been prepared by the Departmental Committee on Electricity; and he pointed out that the Hon. Member for Forfarshire is serving on the Committee. County of London preference were last marked at 9⅞, and City ordinary at 12. Westminsters changed hands at the end of last week at 5 13/16, and business was done the other day in Newcastle-on-Tyne ordinary shares up to £1.

Victoria Falls and Power shares of both classes enjoyed another spurt upon the declaration of a dividend of 5 per cent. upon the ordinary shares. This is the maximum dividend which the optimists had expected some months ago, but just lately their hopefulness had been tempered by the fear lest the excess profits duty might be found to render the payment of the dividend impracticable at the present time, so that the directors' announcement came by way of a pleasant fulfilment of the previous hopes.

The price of the ordinary shares has risen to 16s. 3d., and the preference took a jump of 1s. 6d. to 24s., while the 5½ per cent. second debentures strengthened to 106. The result is certainly good, but it must be remembered that this is the first dividend which the company has ever paid on its ordinary shares, and that some years ago the preference dividend fell into default, all arrears, of course, having been cleared off by now. The preference were quoted at 13s. 9d. on the outbreak of war, and the second debentures were then 83—some 23 points lower than they stand at to-day.

Mexican Light & Power first bonds are 2 better at 39½; but rumour has flown for higher game this week than Mexico, and not much has been heard of the supposed happenings in the latter country. Mexico Tramway bonds are steady, but British Columbia Railways have given way again, falls of 5 points apiece taking place in the preferred and in the deferred stocks. The Argentine group is a little better, the change more marked in sentiment than in business; and Brazilian Tractions, at 48, have so far failed to participate in the mildly buoyant tone which characterises other securities connected with the Republic, this improvement being based on the rise in the Rio exchange.

General Electric ordinary shares at 15½ are 10s. up. British Aluminium rose to 27s. 9d., Callenders preference to 4½. Other manufacturing shares are very firm.

In addition to the strength of the manufacturing shares, the cable market is also good, the outstanding feature being the improvement in West India and Panama shares, these having risen 5s. to 28s. 9d. upon very persistent buying. The Eastern companies are declaring their usual quarterly dividends, and the Globe Telegraph & Trust Co. has issued an excellent annual report. Anglo-American Telegraph deferred is ¼ higher at 32¾. Oriental Telephones rose 3/16 to 2 9/16, and Cuba Submarines at 8½ are a fraction better. Marconis have rather eased off, though attention is being directed to the shares of the Marconi Marine undertaking, the price of which has risen to 2 5/16 upon the annual statement just issued by the company.

The rubber market is weak and flabby, prices in all departments having given way on a drop in the quotation of the raw material to 2s. 4½d. per lb., with the possibility that it may have to go lower still. Various theories are advanced to account for the fall, but the root reason resides in the position created by the entry of America into the war on the side of the Allies. This has enabled the removal of restrictions upon the United States importing rubber direct from the Middle East, and the consequence is that there are large stocks of the product left in London, while the chief buyer is finding her market on the spot.

SHARE LIST OF ELECTRICAL COMPANIES.

	Dividend 1915.	Dividend 1916.	Price June 26, 1917.	Rise or fall this week.	Yield p.c.
HOME ELECTRICITY COMPANIES.					
Brompton Ordinary	10	9	6½	—	£6 18 6
Charing Cross Ordinary	5	5	8½	—	7 2 10
do. do. do. 4½ Pref.	4½	4½	6½	—	6 18 6
Chelsea	4	3	2⅝	—	5 4 4
City of London	8	8	12	—	6 13 4
do. do. 6 per cent. Pref.	6	6	10	—	6 0 0
County of London	7	7	10⅜	—	6 11 9
do. 6 per cent. Pref.	6	6	10	—	6 0 0
Kensington Ordinary	7	10	6½	—	5 11 7
London Electric	3	3	1	—	Nil
do. do. 6 per cent. Pref.	6	4	3⅜	—	5 6 8
Metropolitan	3	3	2½	—	6 0 0
do. 4½ per cent. Pref.	4½	4½	3⅛	—	7 4 0
St. James' and Pall Mall	8	8	6½	—	6 3 1
South London	5	5	2⅜	—	7 5 6
South Metropolitan Pref.	7	7	21/-	—	£ 13 4
Westminster Ordinary	7	7	5⅜	—	6 1 9
TELEGRAPHS AND TELEPHONES.					
Anglo-Am. Tel. Pref.	6	6	98	—	6 2 0
do. Def.	33/6	1½	22⅜	+ ¼	6 16 4
Chile Telephone	6	8	7	—	5 14 4
Cuba Sub. Ord.	5	5	8½	+10/-	5 17 8
Eastern Extension	8	8	13⅜	—	*6 16 6
Eastern Tel. Ord.	8	8	139½	+ ½	*6 14 9
Globe Tel. and T. Ord.	7	7	12⅜	—	*6 9 10
do. Pref.	6	6	10½	—	5 17 1
Great Northern Tel.	22	22	85¼	— ¾	6 8 0
Indo-European	13	13	51	—	6 7 5
Marconi	10	10	3¼	—	3 1 6
New York Tel. 4½	4½	4½	99	—	4 11 0
Oriental Telephone Ord.	10	10	2 3/16	+ 3/16	3 18 0
United R. Plate Tel.	8	8	6⅜	—	*5 18 6
West India and Pan.	6d.	6d.	1 7/16	+ ½	1 14 9
Western Telegraph	8	8	14	—	*5 14 4
HOME RAILS.					
Central London, Ord. Assented	4	4	60½	—	6 8 0
Metropolitan	1	1	23¾	— ¾	4 8 0
do. District	Nil	Nil	16½	—	Nil
Underground Electric Ordinary	Nil	Nil	1⅜	—	Nil
do. do. "A"	Nil	Nil	5/9	—	Nil
do. do. Income	6	5	83	— 1	*6 0 6
FOREIGN TRAMS, &c.					
	Dividend 1915.	Dividend 1916.			
Adelaide Sup. 6 per cent. Pref.	6	6	5	—	6 0 0
Anglo-Arg. Trams, First Pref.	5½	5½	2⅞	—	9 11 4
do. 2nd Pref.	5½	—	2½	—	—
do. 5 Deb.	5	5	66½	—	7 10 5
Brazil Tractions	4	4	48	—	—
Bombay Electric Pref.	6	6	10	—	6 0 0
British Columbia Elec. Rly. Pfce.	5	5	57½	—	8 13 10
do. do. Preferred	Nil	Nil	32¾	—5	Nil
do. do. Deferred	Nil	Nil	37½	—5	Nil
do. do. Deb.	4½	4½	58⅜	—	7 1 8
Mexico Trams 5 per cent. Bonds	Nil	Nil	37	—	Nil
do. 6 per cent. Bonds	Nil	Nil	30	—	Nil
Mexican Light Common	Nil	Nil	14½	—	Nil
do. Pref.	Nil	Nil	22½	—	Nil
do. 1st Bonds	Nil	Nil	39½	+2	—
MANUFACTURING COMPANIES.					
Babcock & Wilcox	15	15	3	—	5 0 0
British Aluminium Ord.	7	10	27/9	+6d.	7 2 10
British Insulated Ord.	17½	20	129	—	7 15 0
British Westinghouse Pref.	7½	7½	2⅜	—	6 6 4
Callenders	20	20	18½	—	7 11 0
do. 5 Pref.	5	5	4½	+ ½	5 17 8
Castner-Kellner	22	22	8⅜	—	6 10 2
Edison Swan, £3 paid	—	—	16/3	—	Nil
do. do. fully paid	—	—	1⅜	—	Nil
do. do. 4 per cent. Deb.	4	4	71½	—	5 12 0
Electric Construction	7½	7½	1 1/16	—	8 0 0
Gen. Elec. Pref.	6	6	10	—	6 0 0
do. Ord.	10	10	15½	+ ½	6 9 0
Henley	25	25	15½	—	8 1 3
do. 4½ Pref.	4½	4½	4	—	5 12 6
India-Rubber	10	10	12½	—	*8 5 0
Telegraph Con	20	20	37½	—	*6 8 2

* Dividends paid free of income-tax.

THE CONTROL OF ALTERNATING-CURRENT LOCOMOTIVES.

THOUGH single-phase locomotives are not at present running in this country, a good many are at work elsewhere, especially on the Continent of Europe, where, prior to the war, the alternating-current system was making rapid headway. One advantage of this system, as all electrical engineers know, is that the pressure at the terminals of the motors can be regulated without resistances, for any voltage within the range of that across the secondary windings of the transformers can be obtained by providing the transformers with tappings. In many instances these tappings are brought into use by means of contactors similar to those which govern the voltage across the motors on continuous-current locomotives and motor coaches, but on some alternating-current engines this plan has been abandoned. The latest locomotives that have been set to work on the Lötschberg Railway, for instance, are not controlled in this way. On these engines, as readers of the ELECTRICAL REVIEW may remember, there are two transformers, and on the top of each is fitted a controller of the drum type, which brings different tappings into service, and the drums are actuated by electric motors in such a way that they can turn in either direction. Each motor imparts a rocking motion to a member carrying two pawls just above a notched wheel mounted on the drum shaft, and either of these pawls can be made to engage with the wheel by energising electromagnets which actuate them. When one pawl is allowed to drop into the notched wheel, the drum is turned in, say, a clockwise direction, whilst when the other pawl is made to engage with the wheel, the drum turns in the opposite direction. All the driver does in order to raise or lower the motor pressure is to energise, by means of the controller in the cab, one or the other of the electromagnets actuating these rocking pawls, when the controller drum is moved round in the desired direction.

It remains to be seen whether this system of control will be adopted on other railways working on the single-phase system. In any case, the builders of the Lötschberg engines have satisfied themselves that large drum controllers operated in this way are preferable to contactors when heavy currents have to be dealt with. The first locomotives set to work on this railway had contactors mounted on the tops of the transformers in the same way as the drum controllers, but these engines were not so powerful as those that have been put into service more recently. The contactors for the original engines were worked with continuous current obtained from a small storage battery charged from a motor generator. The new control system does not eliminate the battery, because continuous current is employed for energising the electromagnets that control the rocking pawls as well as for lighting, but the introduction of the large drum controllers has eliminated many small wires associated with the original control system.

On some of the Continental single-phase locomotives the voltage applied to the motors is controlled by induction regulators. It was proposed, in fact, in the first instance, to fit these regulators to the Lötschberg engines, but the idea was abandoned on the grounds of cost and weight, and because they tend to lower the power factor. To other locomotives, however, these regulators have been fitted, although it cannot be said that this method of regulating the voltage is a very common one. One advantage of the induction regulator is that it provides a means of changing the voltage gradually and evenly, whereas contactors, unless sufficiently numerous, are apt to vary it in jumps. The induction regulator acts as a booster to the transformer in exactly the same way as when it is connected in series with a feeder. The amount of voltage which the induction regulator provides depends upon the position of its movable member with respect to the stationary member which provides the alternating magnetic flux. There is one position for the movable member that gives no boost at all; but by turning this element through a certain angle the voltage across the regulator comes into play, and ultimately a maximum boosting pressure is obtained. Further movement causes this pressure to diminish, and finally brings it to zero, after which it builds up again, but in the opposite direction. An ordinary induction regulator capable of giving all the desired regulation for the motors of a locomotive is, as a rule, unduly large and heavy, and a plan that has been adopted by several manufacturers is to use these regulators in conjunction with a few transformer tappings connected in turn to the regulator by means of contactors.

Let it be assumed that one end of the secondary of a transformer is connected to one terminal of a locomotive motor, and that an induction regulator with its movable element in the position that gives the maximum negative boost is connected in series with the first tapping on the transformer that gives the lowest pressure; then, if the other terminal of the regulator be connected to the other terminal of the motor, the pressure across the motor will obviously be that across the first two tappings of the transformer, minus the opposing pressure of the induction regulator. But on adjusting the regulator so as to make it develop no pressure, the difference of potential across the motor will rise to that between the first two transformer tappings, whilst when the movable part of the induction regulator is made to take up the position that gives the maximum positive boost, the pressure across the motor will be that due to the first two transformer tappings plus that across the induction regulator. When this pressure has been reached, the tapping to which the induction regulator is joined is disconnected by means of a contactor, whilst at the same instant another contactor puts the induction regulator in series with the next transformer tapping, giving the next higher voltage.

This latter contactor, however, joins up the regulator so that its voltage opposes the transformer voltage, just as it did when in series with the first transformer tapping. This process is repeated until the last transformer tapping is reached, when the full transformer pressure is applied to the motor, and the induction regulator is cut out of circuit. The maximum voltage which the induction regulator develops is usually half that across any two transformer tappings, and the regulator is generally operated by a small electric motor, which also actuates a revolving switch, geared so that the contactors are opened and closed at the proper instants. All the driver has to do when he desires to start the locomotive is to close the controlling motor switch, when the contactors close in their proper order, and the induction regulator acts in unison.

Perhaps the most interesting example of the use of induction regulators on single-phase locomotives is to be found on the Midi Railway in France.

On a 1,500-H.P. locomotive all the pressure regulation is obtained with these regulators, and there are no secondary tappings on the transformers. But the regulators are not built upon orthodox lines. The locomotive has two transformers, the cores of each resembling in shape the field system of a bipolar overtype dynamo. The cores not only provide the flux of the transformers, but also act as the stationary part of the induction regulator. The moving element of each regulator is placed between the upper poles or limbs of the transformer, just like an armature that revolves between the poles of a bipolar generator or motor, and the secondary winding of each transformer is connected in series with this part of the regulator, in which the boosting pressure is induced. Geared to this moving element is a small motor which actuates the regulator, and the voltage the latter produces is added to, or subtracted from, the transformer voltage, according to the position in which the moving element stands. In this way a pressure ranging between 200 and 760 volts can be obtained, the change taking place in a perfectly steady manner. It is said that with induction regulators combined with the transformers in this way, the weight of the transformers is only slightly increased, the losses are small, and, all things considered, the system is far preferable to the contactor system.

When locomotives and motor coaches are fitted with repulsion motors, such as Déri motors, the regulation is generally obtained by shifting the brushes. On the Martigny Orsières Railway, in Switzerland, for instance, the motor coaches are controlled in this way. As is well known, the stator winding of the Déri motor is entirely independent of the armature, which has two sets

of brushes, one of which is fixed and the other movable, and the two sets of brushes are connected together by flexible cables. To bring the armature to rest, the movable brushes are shifted into line with the axis of the stator, but on moving these brushes out of this position the armature is made to revolve. The normal working range for the motor lies between four-sixths and five-sixths of the pole-pitch, or between 120° and 150°. When the movable brushes are shifted away from the fixed brushes electrical connection is preserved between them by means of the flexible cables, and when the brushes are brought together there is no potential difference between them. Thus the only current supplied to the stator is the magnetising current, and the conditions correspond to those of a transformer energised on the primary side but working without load. But as soon as the movable brushes are shifted away from the fixed brushes a difference of potential between the two sets of brushes is established; and since the brushes are connected together, currents flow in the armature conductors which the fixed and movable brushes embrace. With different brush positions different characteristics are obtained exactly analogous to those of a series-wound motor working at different voltages, and the speed rises as the distance between the brushes is increased. The torque also varies with the brush position, and is greatest at the lowest speeds. Generally speaking, the starting torque is 2½ times greater than the normal running torque. Although this system of control has been confined mainly to motor coaches, a locomotive with Déri motors, and controlled entirely by shifting the brushes, has been built and tested on the Midi Railway; but it remains to be seen whether the system will make any appreciable headway.

On some locomotives the brush-shifting and variable-pressure regulating systems are combined. It has been found possible with the use of special compensating windings on the poles of series alternating-current motors to shift the brushes with a view to regulation without causing the motors to spark. At the moment of starting the motor is switched on to the lowest voltage transformer tapping, and the brushes are then gradually rocked forward. They are afterwards brought back to their original position, and the next voltage step is brought into use, when the brushes are again rocked forward, and so on, until the maximum pressure is reached. Apart from the fact that this system reduces the number of contactors, it gives uniform acceleration, and the originators of the idea claim that the system is in every way highly satisfactory.

The foregoing are the principal control systems that have been applied to single-phase locomotives. All these systems have been tested on engines that have been built on the Continent, but in America the use of contactors has been rigidly adhered to. The ideas of Continental designers are not at all in conformity, and in time to come it will be interesting to see how many of these new control systems establish themselves.

PRECIPITATION OF SMOKE AND FUMES.

The Cottrell Process in Practice.*

By LINN BRADLEY.

In general the problems of fume prevention or elimination may be considered from two standpoints: First, that of the nuisance to the neighbourhood; second, that of the values which are recoverable. This latter aspect involves also other economies in plant operation.

Sulphur-dioxide and sulphur-trioxide are of prime importance in any discussion of this subject. The large quantity of sulphur-dioxide to be cared for presents one of the most difficult problems. The white fume which is referred to as sulphur trioxide really consists of very small particles of sulphuric acid, and is readily collected by the electrical precipitation process. On the other hand, sulphur dioxide, being in the gaseous condition, is not collected, unless provision is made for its absorption by some reagent previous to treatment in the precipitator, and then precipitating the resulting compound.

The application of the electrical precipitation processes to the recovery of dust and fume in smelters and refineries has already shown that the large losses of the past can now be prevented. The tendency at present is to avoid the construction in new plants, or the use in old plants, of large and expensive dust chambers, as these are now unnecessary. By concentrating all of the fume-collecting facilities at one point, enough money has been saved in some cases entirely to pay for the expense of the new and more efficient installation.

In the western part of the United States are located most of the large smelters, the principal ones being devoted to the treatment of copper, lead, silver, and zinc ores. At these smelters much attention has been given to flotation for some time past. The roasting of flotation concentrates may give high dust and fume losses, but the collection of this material is a comparatively simple matter, as far as the technique of the electrical precipitation processes is concerned. The gases submit readily to treatment, and the values in the collected material are sufficiently high to warrant the expense of a Cottrell precipitator installation and operation.

There are many chemical plants, foundries, and factories in the eastern section of the country at which the nuisance problem, as well as the problems of recovering values and improving sanitary conditions, is of great importance. The elimination of acid fumes, such as sulphuric, nitric, hydrochloric, and even phosphoric, presents a great variety of interesting problems.

In factories it is often desirable to remove practically all the suspended dust particles from the air admitted to the rooms. In the operation of a sand-blast equipment a large amount of fine dust is produced, and this is best collected at a point near its source. In these foundry and factory problems, where the air is re-utilised after treatment for the removal of suspended dust, the possible saving, due to the conservation of heat in the winter time, is of considerable importance.

The Cottrell process can be operated throughout a wide range of temperature up to that at which insulating materials and metals lose their essential qualities, the one as to electrical features, and the other as to mechanical strength. Corrosive substances can be readily handled, since it is possible to construct the precipitator of material which will withstand corrosion. An investigation at the plant is often necessary before the precipitation installation can be designed and constructed, as the precipitators generally are designed to fit special conditions in most of the important problems.

The alternating current may be obtained either from a motor-generator set, or from the plant circuit if the latter has suitable characteristics. In either case the alternating current is fed to a step-up transformer, and the voltage raised generally to a point between 50,000 and 100,000 volts, depending upon the local conditions. The high-voltage alternating current is rectified to an intermittent high-voltage direct current by means of a suitable rectifier. When alternating current possessing suitable characteristics is available at the plant, the rectifier is driven by a small synchronous motor directly from the plant power circuit, but if a motor-generator set is required the rectifier is connected directly to the shaft of the motor-generator set and driven by it. The rectifier thus operates in synchronism with the current supplied to the transformer. A simple switchboard is provided for controlling the electric circuit.

The transformers are often rated at 10 K.V.A., 50,000 to 100,000 volts, with the low-tension voltage at 200 or 400 volts. Usually a number of taps are brought out on the low-tension side so that the high voltage may be varied between 50,000 and 100,000 in steps of about 5,000 to 10,000 volts each. Some resistance is placed in the low-tension circuit to the transformer, to obtain a closer regulation of the voltage than is possible with the taps alone, and to limit the amount of current which can flow when a spark-over occurs in the precipitator. The electrical equipment, including the transformer, motor-generator set, or synchronous motor, and the rectifier, should be protected against electrical surges. Inductances placed in the lines at proper points, when used in conjunction with suitable resistances and ground connections, have very beneficial effects; the resistance in the high-tension circuit, used in conjunction with choke oils, is installed for the purpose of dissipating the energy due to surges, thus promoting steadiness and reliability of operation, and permitting higher voltages to be maintained.

A 10-K.V.A., 100,000-volt equipment, consisting of transformer, synchronous motor, rectifier, and switchboard, may be obtained from about $1,200 to $1,500. If a motor-generator set is required, the cost will be considerably higher. The difficulty of continuously rectifying excessive currents makes it advisable to keep the power capacity of the electrical sets down to a reasonable value, say between 5 and 50 KW., although it must not be inferred that 50 KW. is the safe upper limit.

Serious and baffling technical difficulties have been encountered in the operation of large-scale precipitation installations, even when successful small-scale tests with the processes had been made before building the precipitator;

* Abstract of paper presented at a joint meeting of the New York Sections of the American Institute of Mining Engineers and the American Electrochemical Society on January 26th, 1917. From *Metallurgical and Chemical Engineering.*

The Cottrell process was described in the Electrical Review of May 14th, 1915.

even after it has been found possible to operate the Cottrell process satisfactorily on a given gas and fume with a single-pipe test precipitator, we should proceed to make tests under the entire range of operating conditions then existing, or to exist, in the plant. After concluding such tests the large precipitator for commercial operation in the plant should be so designed, constructed, and operated that no extraneous factors are introduced.

Some of the factors which affect precipitator operation are as follows: Character of the dust and fume content of the gases; gas composition and temperature; gas speed and density; number and size of fume particles per cubic foot of gas and per unit of time per unit of electrode surface; the shape, size, length, and composition of the electrodes; and the amount and character of deposit on the electrodes. Since all of these things have an effect on operation, if single-pipe tests have proved that satisfactory results may be obtained throughout the range of working conditions, the plant operator would do well to confine his efforts to ensuring that all the gas and electrical conditions in each pipe correspond to those which were existent in the single-pipe tests. Unless these conditions are actually duplicated, and not merely assumed to be so, one can well go astray and be a long time in obtaining the results which he seeks.

Unless the gases in all the pipes have the same characteristics in all respects it will be necessary to keep the voltage low enough to prevent spark-over in the gas which is, electrically speaking, the weakest.

Suppose that there is an excessive temperature in even one or a few pipes of the precipitator, and that this condition continues for only a fraction of a minute at a time, but is occasionally repeated; it will be seen that the voltage which can be maintained in the precipitator as a whole will be limited to that which the weakest gas will permit, and this, in turn, affects the entire operation of the precipitator. In order to obtain the maximum results from any precipitator, the gases must be uniformly mixed and uniformly distributed through the various pipes, and the precipitator built and operated in such manner that each pipe has exactly the same duties to perform, under identical conditions.

It having been considered necessary to look for reasons for the difficulty encountered in treating certain non-conductive gases, a survey was made of all the problems with which we have had any experience. One of our first clues came from some work we had conducted in connection with the precipitation of anhydrous tin chloride. We found that if we introduced the proper amount of steam and thoroughly mixed it with the gases prior to treatment electrically, precipitation was made very easy, while without the addition of this moisture good precipitation was impossible. The phenomenon was very striking. By a very slight turn of the steam valve, so as to introduce just sufficient moisture, the operation of the precipitator was immediately changed, and instead of a condition of violent sparking steady operation with a good flow of current, such as is always desirable, was obtained. It occurred to us that the dehydrating action of the tin chloride had a very important effect upon the operation of the precipitator.

The same phenomena appeared when we started work on the precipitation of zinc oxide fumes, and after considerable investigation it was found that with the introduction of a proper amount of moisture in the proper manner, these fumes could be handled very successfully at temperatures even as high as 600 deg. to 700 deg. F.

The mere introduction of moisture into the gases, however, does not suffice; it is necessary, according to our experience, if best results are to be obtained, to introduce the moisture in such manner that it becomes thoroughly mixed with the entire body of gases prior to subjection to treatment, and the installation should be so arranged that this uniformity of gas composition, fume burden, and temperature is maintained for reasonable periods.

Cold and dry air, such as exists in the winter time, should not be allowed to enter any part of the precipitator, if the evidence from tests indicates that the resulting gas condition will necessitate a lowering of the voltage on the precipitator. This shows that the geographical location of the precipitation installation, and the altitude, are important factors, as some have warm and moist atmosphere, while others have the opposite. In some cases the precipitator pipes should be enclosed to protect them from winds. If the precipitator has not an upper header, provision should be made to prevent wind sweeping down upon the open-ended pipes and creating uneven pressure zones above them, as this affects gas distribution, &c.

One of the most suitable methods for ensuring uniformity of distribution in vertically positioned precipitator pipes is to place a specially designed orifice at the top of each pipe, thus creating a slight pressure difference, amounting to perhaps 0.05 to 0.10 in. of water, across these orifices when gases flow through them.

The acid and moisture generally contained in the gases from smelters make their problems relatively easy from the standpoint of electrical precipitation, but it does not follow that a well-designed and well-constructed precipitator which proves highly successful in connection with one problem, can be installed at another place in connection with another problem, and be equally successful.

In installing a precipitation installation it would be disastrous to overlook the fact that the furnaces or other sources of the fume are of primary importance, and nothing should be done which will interfere with their operation. Similarly, the draught requirements as to intensity and regulation should always be kept in mind. The flues should be so constructed that the draught drop through them is made very small, and if any draught drop is to be tolerated it should be concentrated at a point in the precipitators where it can do the most good, namely, across the orifices, if this method of obtaining uniform distribution is used.

In conclusion, it might be mentioned that there are many plants in commercial operation on the continent of North America, several on the continent of Europe, in England, some in Japan, Africa, and South America, and the work is growing very rapidly. Standardisation of the methods of handling problems, and the design of standard apparatus, are progressing, and the work is being more effectively organised.

THE FUTURE OF THE BRITISH X-RAY INDUSTRY.

THE discussion on the future of the British X-ray industry, which had already occupied the Röntgen Society for two evenings, was brought to a conclusion at the meeting on June 5th. Captain ROBERT KNOX, in re-opening, said that there were three principal reasons for the failure of the X-ray industry to hold its own in the past. There were: (1) Lack of capital, (2) want of co-operation between manufacturers, and (3) failure to employ highly technical men to carry out contracts. Among the first steps which should be taken in the future to secure the rehabilitation of the industry were (1) closer co-operation between the physicist, the technical expert, and the practising radiologist, and (2) the amalgamation of existing businesses into one large corporation. A school of British radiology, he added, had always existed, and only needed stimulating.

Lieut.-Col. ROBERT WILSON, of the Canadian Army Medical Corps, said that his 30 years in the Colonies might perhaps entitle him to a voice in "diagnosis" and "treatment." The trouble was that we in this country had been content to make discoveries and to allow other countries to exploit them. We had satisfied our intellectual aptitude for science, but we had left the practical application to somebody else. He doubted whether it would be possible to form the X-ray industry in this country into one large company, but he suggested that firms might have a mutual understanding by which each manufacturer could concentrate upon some definite and standardised part of the apparatus required, so that there need not be so much wasteful overlapping. Mr. J. H. WEBB was also unfavourable to the idea of a combination of manufacturers, believing that it would kill individualism.

Mr. HOWARD C. HEAD, of Messrs. Siemens, said that in the course of the discussion the radiologist, the physicist, and the manufacturer had been repeatedly mentioned, but the electrical engineer had been entirely omitted, and this seemed the more strange when it was remembered that the first president of the Society was the late Prof. Silvanus Thompson, and that among the ex-presidents were such illustrious electrical engineers as Mr. Duddell and Mr. Campbell Swinton. The subject from its very inception was an electrical proposition, and until the brains of the best electrical engineers were brought to bear upon it, they could not hope for much progress. X-ray apparatus presented problems which required the skill of the expert electrical engineer as well as the mechanical engineer. His knowledge of machines must be so broad as to make him familiar with the characteristics of motors from 1/20 H.P. upwards. The high-tension transformer up to 200,000 volts, and 25 to 30 K.V.A. required special design. The ordinary principles had to be modified; the tests required were highly involved. Precautions against high-frequency surges had to be taken, abnormal loadings and phase displacement considered. Or, if they considered the diathermy apparatus, which although not an X-ray apparatus was closely allied, they found it full of problems for the electrical engineer. The instrument was practically a miniature wireless outfit, but, as the engineer well knew, it was utilised in medicine under far different conditions. In the one case there was a free radiating surface; in the other this was replaced by the human body. What the difference was precisely they could not say, but when the doctor stated, for example, that he required more current, that is, more amperes, the question for the engineer was as to what he really meant, and whether it was not rather a matter of intensity than of amount, and of area and distribution rather than quantity. These random examples, he thought, would suffice to prove his contention that rather than omit the electrical engineer, as had been done, they must look to him for first principles, and all along the line as well. The manufacture of X-ray apparatus hardly fell into its correct class in the early days; it was work for the expert electrical engineering firms, and not for the scientific instrument makers, but this fault was being remedied. He suggested that a committee be formed consisting of radiographers, physicists,

electrical engineers, and manufacturing engineers, two of each class, to meet periodically for the consideration of the problems which arose in the every-day work of the radiologist, to assist one branch of science by another, to encourage inventors and investigate their inventions, to tabulate the efficiency of apparatus, and to advise manufacturers on the development of apparatus abroad.

Replying upon the whole discussion, Mr. GEOFFREY PEARCE, the original opener, said that he could not see eye to eye with one or two of the manufacturers who had spoken. He hardly thought it could be seriously suggested, as had been done by one speaker, that the medical profession should pay 10 or 15 per cent. more in order to help the British manufacturer, unless—and this was the important point—superior appliances could be obtained in this country, and then they had certainly every right to expect the medical profession to do so. Unless manufacturers produced here apparatus which was equal, if not superior, to that made abroad, they could not possibly hope for the support of the medical profession.

On the motion of Mr. PEARCE, an advisory committee was appointed to consider in what particular direction the Röntgen Society could further the interests of the industry.

FOREIGN AND COLONIAL TARIFFS ON ELECTRICAL GOODS.

SWITZERLAND.—A revised list of articles in respect of which licences for export to Switzerland are only granted if the goods are consigned to the Société Suisse de Surveillance Economique has been issued by the Foreign Office. Among the goods of interest to the electrical industry are the following:—

Accumulators, electric, and accumulator plates; aluminium in all forms and aluminium bronze; anti-friction metal; antimony in all forms; *batteries, electric, and parts;* bauxite; cable, insulated; cadmium; carbons (electric)—*carbons for electricity (except electrodes) and carbon brushes for dynamos, can be sent under the small-parcel system* (see below); *celluloid, raw, in bulk, sheets, rods, tubes, clippings, and waste* (but not wares); copper ore, pure metal, and alloys of, in all forms, and waste; copper wares, including carbons for electricity containing copper, and including all metal articles containing 10 per cent. or more of copper and its alloys; perforated copper plates; copper leaf; copper cables, insulated and non-insulated; insulated electrical copper wires; copper cables with lead sheath, or iron fittings; electrical cables of all kinds containing copper; dynamos; electrical appliances adapted for use in war, and their parts; electrical fire-lighters; electrical insulated wire and cables; electrodes, piles, and component parts; felspar; ferro-chrome and ferro-nickel, and all other ferro-alloys; filings and scrap, of old copper, tin, zinc, and their alloys; fulminate of mercury; fuses (miners'); *gloves, rubber;* graphite, all forms; insulating materials; iridium; lead in all forms; machinery and parts thereof in special steel, *i.e.*, high-speed steel, nickel steel, &c.; electrical machinery, electric dynamos, and motors; magnetos and their parts; manganese, ore and metal in all forms; molybdenum, ore and alloys; nickel, ore and metal, pure and alloyed, in all forms; plumbago; rubber, viz., balata, gutta-percha, raw or re-melted, including waste and ebonite, rubber wares, rubber-proofed and rubber-mixed goods, and rubber preservatives; scheelite; searchlights; steel, special, containing 0.5 per cent. of nickel-chrome or tungsten, 0.2 per cent. of molybdenum, 0.1 per cent. of vanadium or titanium, 9 per cent. of manganese, 0.5 per cent. of cobalt (stellite), including tools, machine parts and all articles in special steel; talc; *telegraph and telephone apparatus, parts of;* telegraph and telephone materials; tin, ore and metal, pure and alloyed, in all forms (*sheets of pure tin can be sent under the small-parcel system*); titanium, ore and metal; tungsten in all forms; vulcanised fibre, all forms; vulcanised rubber in sheets; wire, insulated; wolfram, ore and metal, all forms.

The articles printed in italics are allowed to benefit under the special system for small parcels, *i.e.*, they may be exported to Switzerland without an acceptance certificate being previously obtained from the S.S.S. It is to be understood, however, that this does not affect the necessity of applying for a licence to the War Trade Department, who reserve their right to insist on the production of a certificate from the S.S.S. where this is considered desirable. Parcels thus exported, whether by post or otherwise, must nevertheless be consigned to the S.S.S. for the account of the ultimate consignee *viâ* the International Postal Parcels Bureau at Pontarlier. [It should be noted that articles or substances composed wholly or partially of products named in the list must themselves be consigned to the S.S.S.]

ITALY.—In spite of the recent Decree (see the REVIEW of May 18th) prohibiting the importation of all foreign goods with the exception of certain foodstuffs and raw materials, the prohibition is not being applied *for the present* to goods imported into Italy from the United Kingdom. Among the raw materials excepted from the provisions of the Decree are metallic ores, metals, raw and semi-worked, mica, graphite, and crude rubber and gutta-percha.

UNITED STATES OF AMERICA.—According to a recent decision of the United States Treasury Department, samples of small size can no longer be admitted free of duty as merchandise of no commercial value. Such samples must in all cases pay duty except when a bond is given for their re-exportation within six months.

NEW PATENTS APPLIED FOR, 1917.

(NOT YET PUBLISHED).

Compiled expressly for this journal by MESSRS. W. P. THOMPSON & Co., Electrical Patent Agents, 285, High Holborn, London, W.C., and at Liverpool and Bradford.

8,300. "Switch-controlling means for electric lampholders, &c." G. ST. J. DAY. June 11th.
8,318. "Electrical switch apparatus." E. GOLDSTON & E. W. WOOD. June 11th.
8,343. "Electric insulating materials." A. R. MULLER. June 11th.
8,385. "Device for use with telephone, &c., receivers and transmitters." J. LAVINE. June 12th.
8,415. "Timing arrangements for magneto-electric, &c., machines." G. GREEN & F. MAY. June 12th.
8,416. "Electric signalling systems." F. G. BELL, W. C. DAVEY, AND STERLING TELEPHONE & ELECTRIC Co. June 12th.
8,446. "Electric sparking plugs." A. A. SCOTT. June 13th.
8,448. "Electrical cables." W. BROWN. June 13th.
8,453. "Secondary generators." W. S. DENNETT. June 13th.
8,459. "Magneto motor." D. SUCHOSTAWER. June 13th.
8,460. "Apparatus for measurement of strength of magnetism of permanent magnets." A. BURSILL. June 13th.
8,463. "Electrical safety alarm for water gauges of boilers." H. J. HIRST. June 13th.
8,467. "Contact-making meters." BRITISH THOMSON-HOUSTON Co. (General Electric Co., U.S.A.). June 13th.
8,468. "Dynamo-electric machines." C. L. BREEDEN, H. LUCAS & W. C. TURNER. June 13th.
8,470. "Switchboards." FERGUSON, PAILIN & Co., AND G. PAILIN. June 13th.
8,478. "Electric furnaces." O. SAHLIN. June 13th.
8,482. "Telephone system for aeroplanes." MATERIEL TELEPHONIQUE SOC. ANON. AND WESTERN ELECTRIC Co. June 13th.
8,491. "Apparatus for electric welding." T. MERCER & H. L. POLLITT. June 14th.
8,507. "Ignition system for internal-combustion engines." W. MILLS AND W. MORGAN. June 14th.
8,532. "Electric ignition and lighting systems." F. H. FARRER, G. FUNCK, AND VILLIERS ENGINEERING Co. June 14th.
8,551. "Dynamo-electric generators." C. A. ATHERTON. June 14th.
8,553. "Electric oscillating or wireless systems and apparatus." INDO-EUROPEAN TELEGRAPH Co., H. R. RIVERS-MOORE & A. H. MORSE. June 14th.
8,579. "Watertight fitting for electric lamps, &c." R. E. H. W. EYRE AND W. HARRISON. June 15th.
8,585. "Electric switches." G. O. DONOVAN & W. DONOVAN. June 15th.
8,586. "Zinc cups of electric batteries and manufacture of same." H. V. BAILEY. June 15th.
8,589. "Electric storage batteries or cells." I. CASSAN. June 15th.
8,598. "X-ray tubes." W. J. ROBINSON. June 15th.
8,606. "Coin-in-slot machines for telephones." G. C. ADAMS. June 15th.
8,621. "Electrical switches." W. ELLERD-STYLES. June 15th.
8,622. "Dynamo-electric machines." C. L. BREEDEN, H. LUCAS & H. E. MOORE. June 15th.
8,627. "Protective apparatus for dynamo-electric generators." W. T. TALLENT-BATEMAN. June 15th.
8,628. "Variable electric resistances." A. W. ISENTHAL. June 15th.
8,631. "Magnetic belting." P. L. WESTON. June 15th. (Australia, January 8th.)
8,634. "Phase transformers or converters." F. CREEDY. June 15th.
8,638. "Electric controllers." EDISON ACCUMULATORS, LTD., E. W. LEWIS AND J. F. MONNOT. June 15th.
8,659. "Controlling and regulating devices for electric motors." ELECTRIC AND ORDNANCE ACCESSORIES Co. & N. G. LANGRISH. June 16th.
8,682. "Holders or fittings for electrodes of electric furnaces." P. FAWCETT & J. R. HOYLE. June 16th.
8,690. "Reflectors for electric bulb lamps." H. A. TAYLOR & H. S. WILLIS. June 16th. (Australia, August 11th, 1916.)
8,692. "Electric heating systems." H. H. BERRY & J. R. QUAIN. June 16th.

PUBLISHED SPECIFICATIONS.

1915.

18,213. TRAIN BRAKE SYSTEMS. Sprague Safety Control & Signal Corporation. (December 31st, 1914.)

1916.

The numbers in parentheses are those under which the specifications will be printed and abridged, and all subsequent proceedings will be taken.

13,523. PROCESS FOR OBTAINING BY A COLD PROCESS A GALVANIC DEPOSIT OF ALUMINIUM. E. L. Lalbin. September 23rd, 1916. (106,400.)
15,001. DEVICES FOR SUBMARINE WARFARE. J. A. Steinmetz. October 31st, 1916. (106,418.)
16,750. APPARATUS FOR DETECTING THE PRESENCE OF COMBUSTIBLE GASES. A. Philip & L. J. Steele. November 22nd, 1916. (106,427.)
7,214. ELECTRIC MOTORS WITH REDUCTION GEARING. C. A. Atherton. May 20th, 1916. (106,518.)
9,866. ELECTRICAL OPERATING OR CONTROLLING APPARATUS. T. McLeod. July 13th, 1916. (106,556.)
11,961. MOUNTINGS FOR ELECTRIC AND OTHER LAMPS AND THE FITTINGS THEREOF. W. G. Armstrong, Whitworth & Co. and A. S. Cheetham. August 23rd, 1916. (106,569.)
13,150. ELECTRIC CABLE TERMINALS. W. T. Henley's Telegraph Works Co. and W. H. Nichols. September 15th, 1916. (106,573.)
17,212. SYSTEM FOR CONTROLLING ELECTRIC APPARATUS BY WIRELESS TRANSMISSION. E. H. Widegren & K. A. Widegren. December 20th, 1915. (102,942.)

1917.

1,346. SMALL ELECTRIC MOTORS. E. Volkers. February 17th, 1916. (104,170.)
1,581. VAPOUR ELECTRIC CONVERTORS. British Westinghouse Electric and Manufacturing Co. (Westinghouse Electric & Manufacturing Co. U.S.A.). January 31st, 1917. (106,591.)
2,487. ELECTROMAGNETICALLY-OPERATED CONTACT MAKERS OR SWITCHES. G. D. Peters & Co., F. C. Hibberd and W. King. June 27th, 1916. (Divided application on 16,765/15.) (106,597.)

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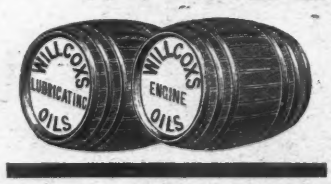

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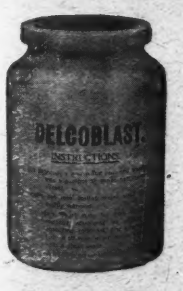

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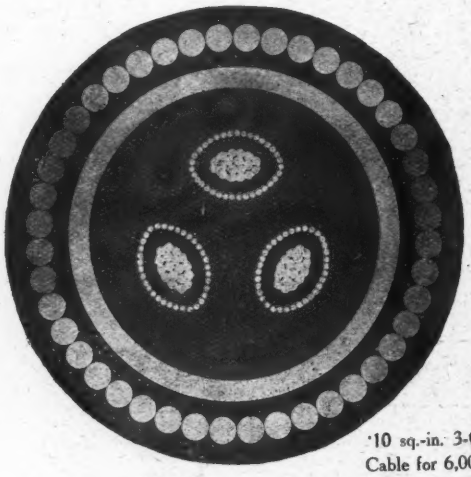

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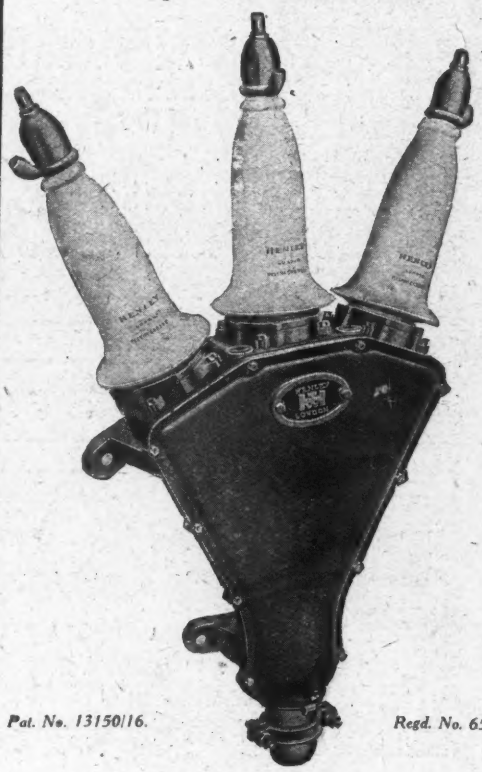

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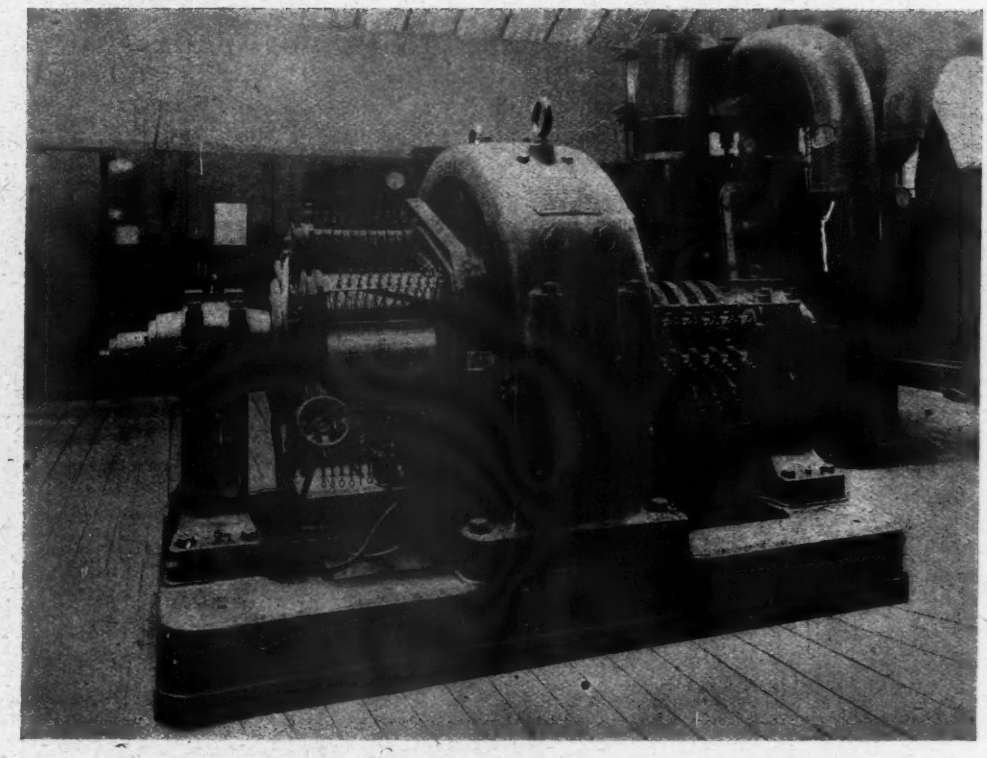

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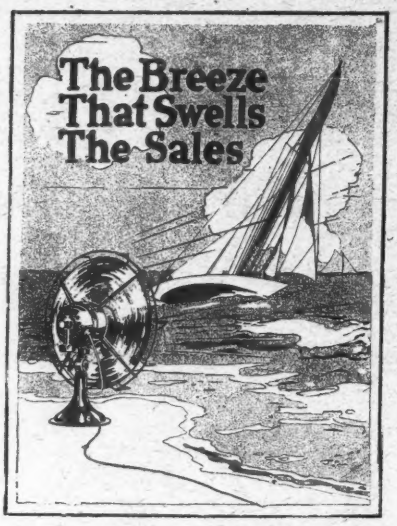

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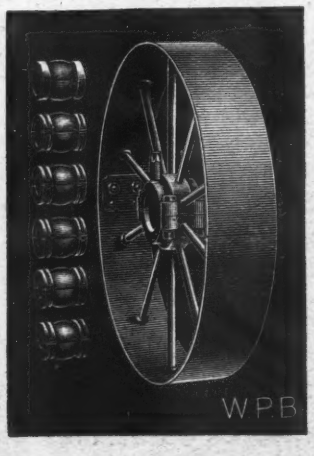

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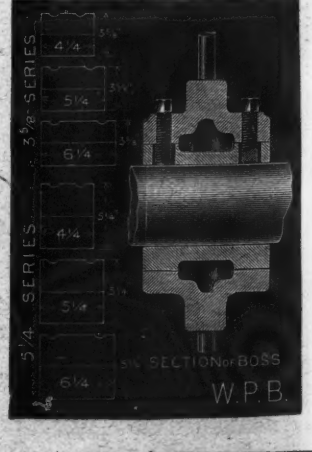

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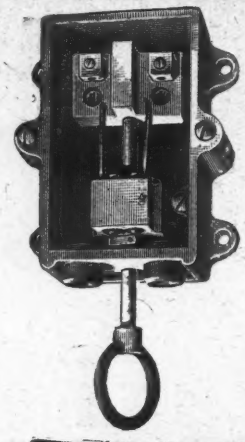

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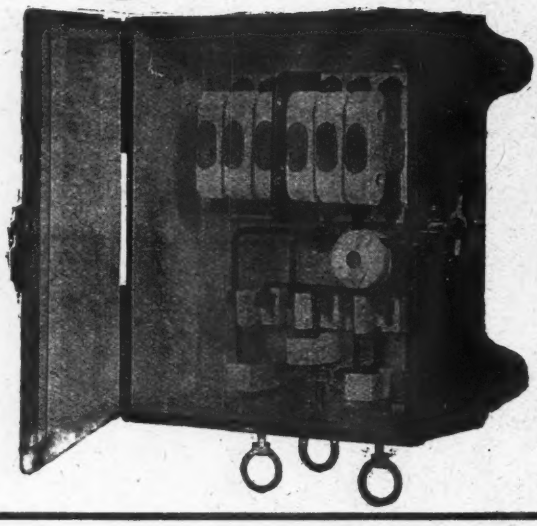

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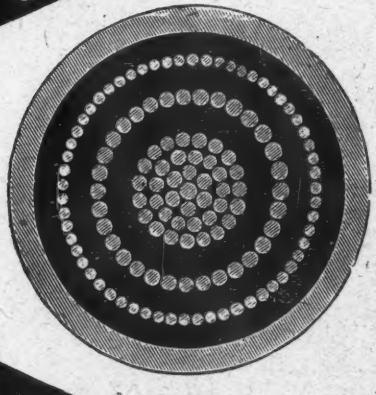

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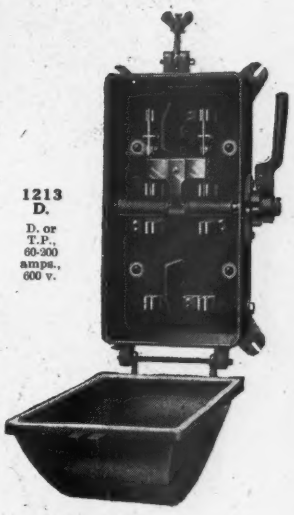

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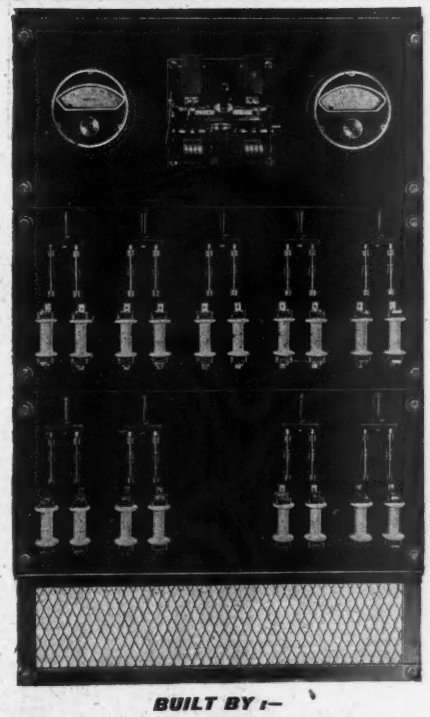

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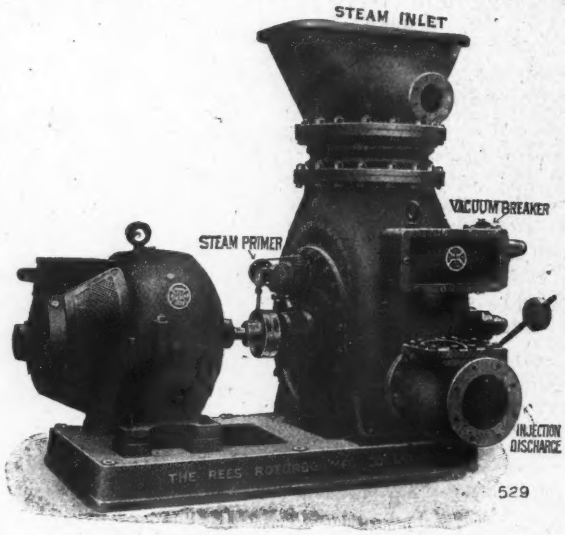

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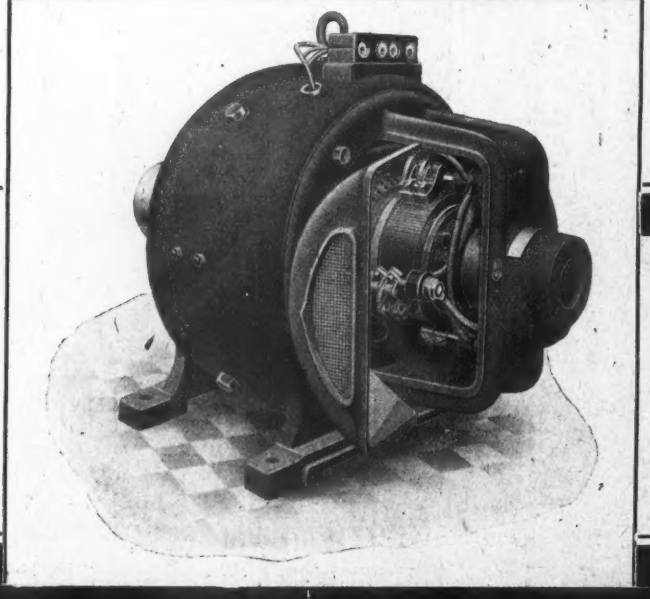

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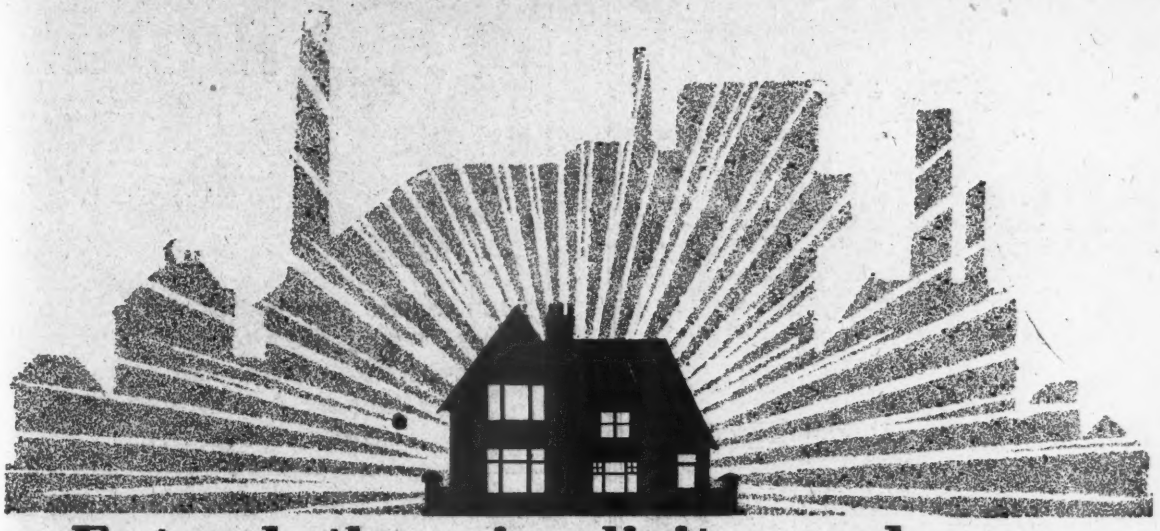

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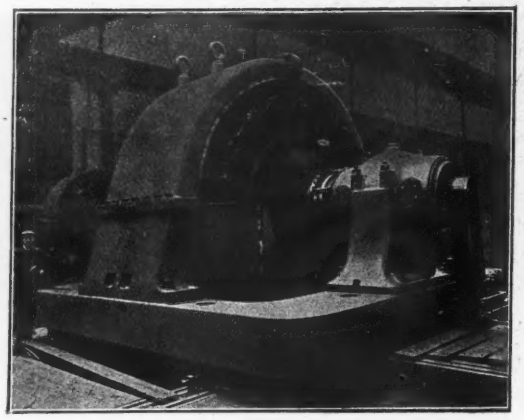

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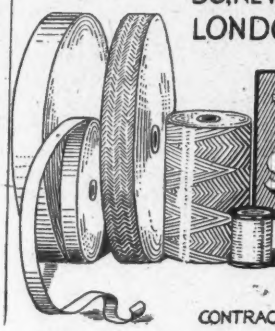

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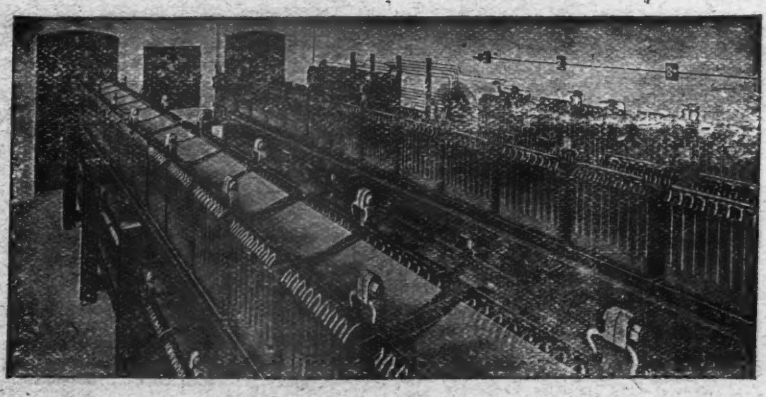

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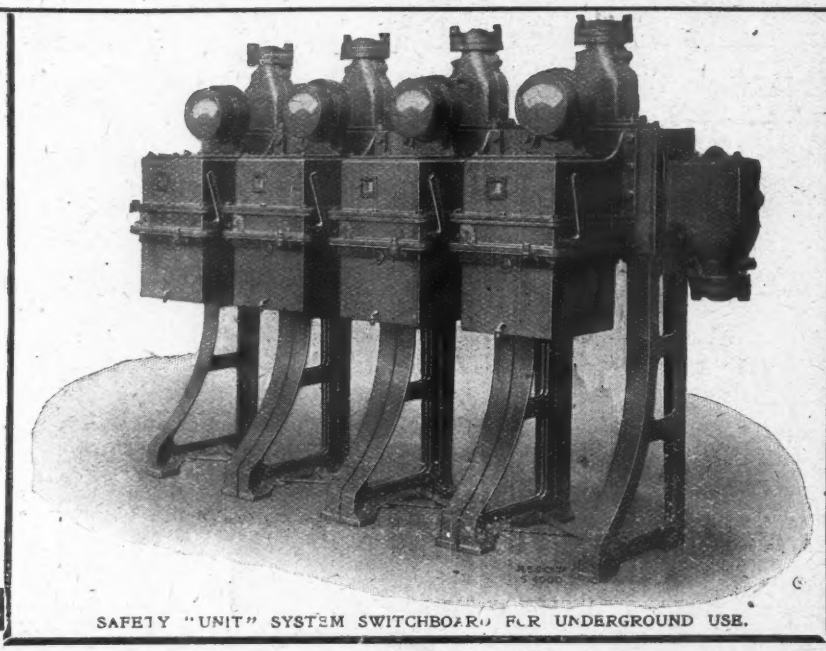

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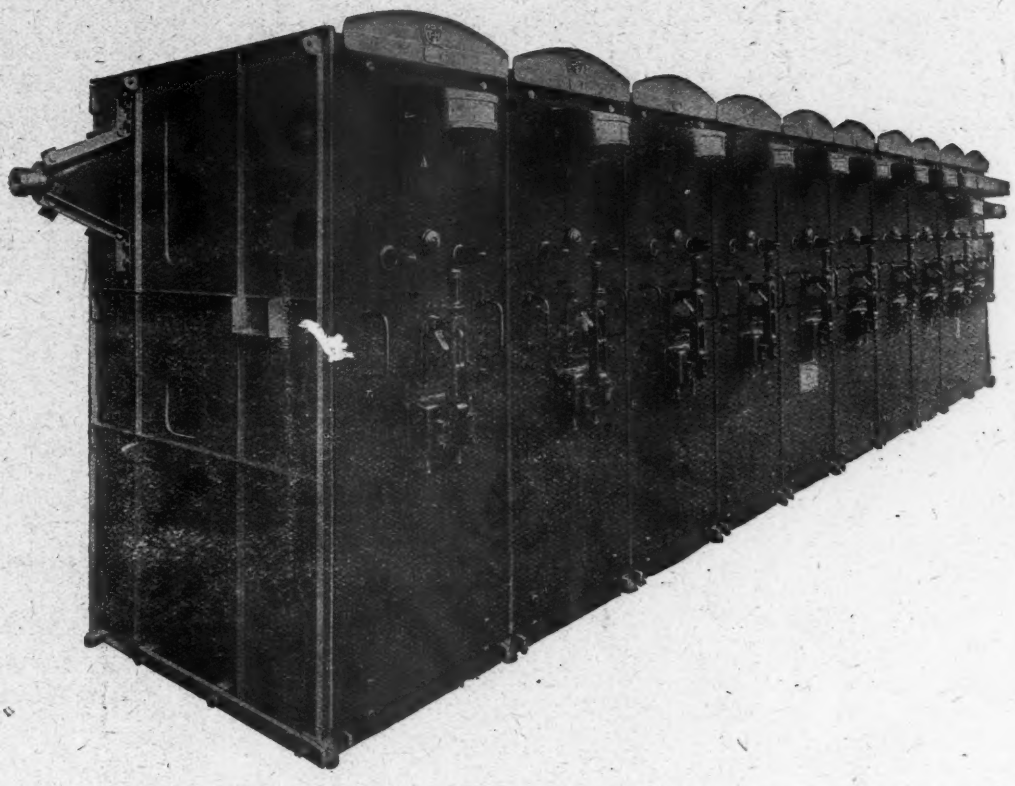

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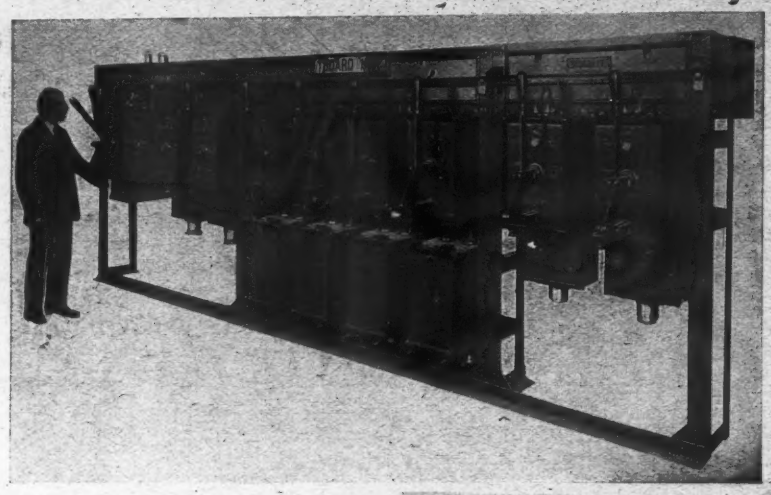

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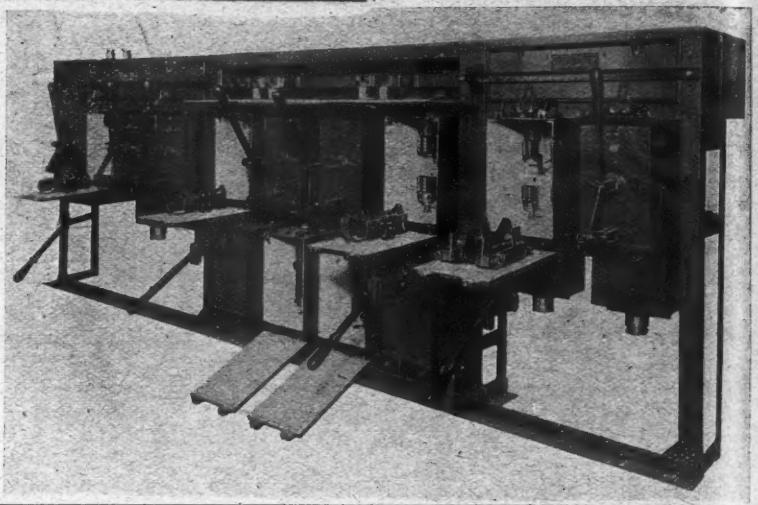

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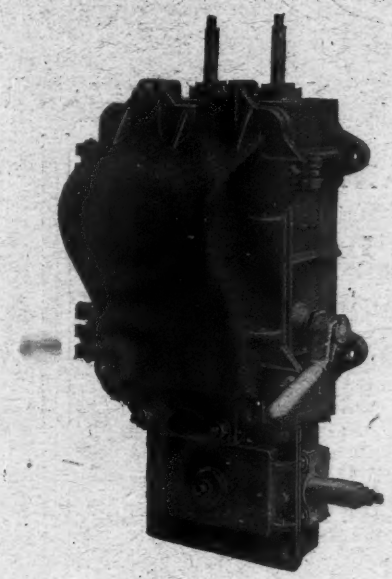

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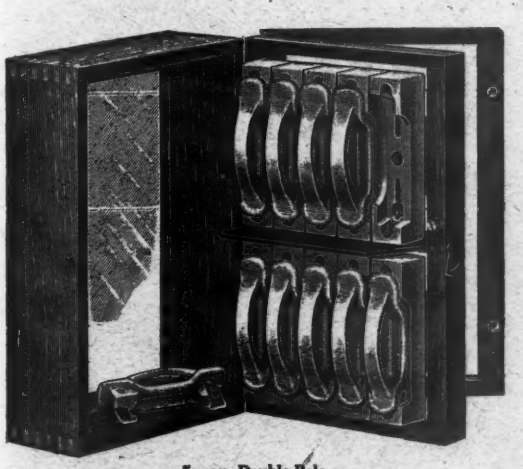

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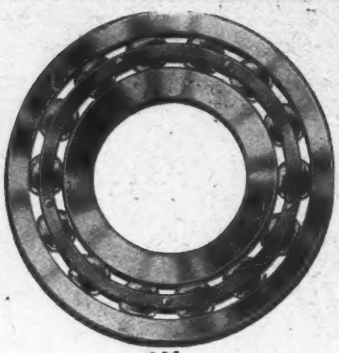

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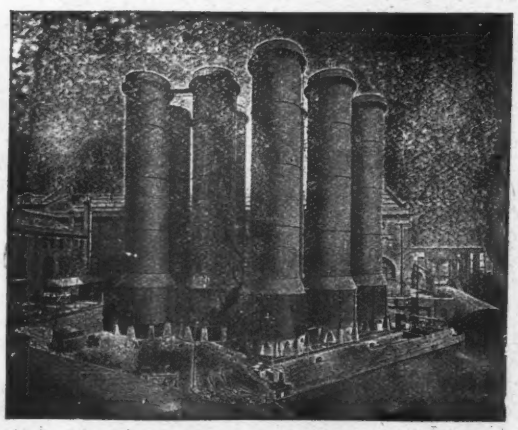

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No. P 64/641. 3 by 3½ in. 16/8 Doz.
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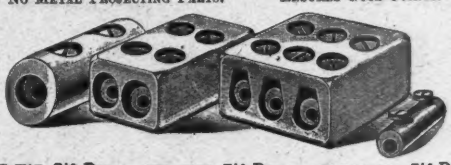
"INDISPENSO" CHINA CONNECTORS.

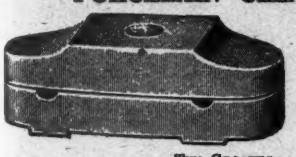
We have designed the "INDISPENSO" CHINA CONNECTOR for positions where very small space is at disposal. Takes up to 7/20 cable.

NO METAL PROJECTING PARTS. ENSURES GOOD JOINTS.



ONE WAY, 2/4 Doz. TWO WAYS, 3/4 Doz. THREE WAYS, 5/4 Doz.
PRICES FOR LARGER QUANTITIES ON APPLICATION.
All prices subject to trade discount. Made in eight different sizes.

PORCELAIN CLEATS.



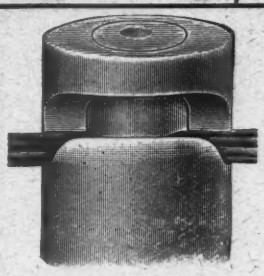
Prices are subject to Trade Discount.

Two Grooves.

No.	Length	Width	Height	Grooves size	Per 144	Per 1000
65/630	1⅛ in.	⅜ in.	1 in.	7/16 in.	6/8	44/-
65/631	2½ ,,	1 ,,	1 ,,	½ ,,	12/8	80/-
65/632	4 ,,	1⅜ ,,	1⅜ ,,	½ ,,	32/-	200/-
65/636	5½ ,,	1⅜ ,,	1⅜ ,,	½ ,,	40/-	280/-

Three Grooves.

65/633	1⅛ in.	⅜ in.	⅜ in.	7/16 in.	7/-	44/-
65/634	2 ,,	1⅜ ,,	1 ,,	½ ,,	12/8	88/-
65/635	4 ,,	1⅜ ,,	1⅜ ,,	½ ,,	40/-	220/-



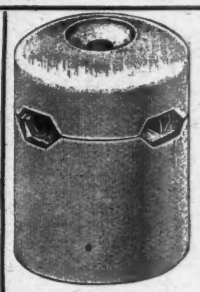
GRIP INSULATORS.

A useful Insulator, largely used for carrying Bare or Insulated Cables. Simple to fix.

List No.	Maximum Diam. of Cable the Insulator will grip.	Per doz.
P 64/1	⅛ in.	2/2
P 64/2	¼ in.	2/6
P 64/3	⅜ in.	3/4
P 64/4	½ in.	8/-

Special Prices for large quantities.

Prices are subject to Trade Discount.



CHINA GRIP INSULATORS.

Prices are subject to Trade Discount

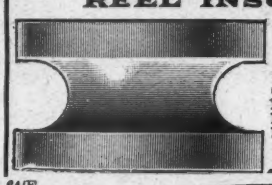
WHITE PORCELAIN INSULATORS.

Nos. 64A to 64F.

Prices are subject to Trade Discount.

List No.	64/A	64/B	64/F	64/D	64/E
Overall size	2 × 2	1½ × 1½	1 × 1	⅞ × ⅞	¾ × ¾
Groove, in.	⅜	⅜	¼	¼	⅛
Hole, in.	⅜	⅜	¼	¼	¼
Per doz.	3/-	1/-	1/6	6d.	8d.
Per 144	25/-	8/-	10/-	4/-	5/-

REEL INSULATORS.



White Porcelain.

List No.	64/74	64/41	64/42
Dia.	1½ in.	2 in.	2½ in.
Height	⅝ in.	1 in.	1¼ in.
Grooves	⅜ in.	½ in.	⅝ in.
Hole	7/16 in.	½ in.	⅝ in.
Per doz.	1/-	1/4	2/8
Per 100	8/-	10/6	20/-

Subject to Trade Discount.

List No.	Height in inches.	Diam. in inches.	Grooves take Diams.	Per dozen.
P 65/620	1⅞	1⅝	⅜	2/6
P 65/621	2	1⅝	⅜	3/6

INSULATING HOOKS.

List No.	Length	Per doz.
P 48/620	Split 1 in.	2/6
P 48/621	,, 2 ,,	2/6
P 48/622	,, 3 ,,	3/-

Ward & Goldstone SALFORD MANCHESTER

A STRAIGHT ISSUE.

THAT SANDERS' PATENT FUSE SYSTEM

Is the Finest Fuse System Ever Produced, of which We are the Sole Patentees and Manufacturers.

WE CAN DEMONSTRATE THAT TO YOUR ENTIRE SATISFACTION.

SOME SPECIAL FEATURES.

Will protect any Power or Lighting Circuit under the most exceptional Short Circuit conditions.

Impossible to Over Arc from Contact to Contact.

Each Fuse is itself a powerful Magnetic Blow Out.

Each Fuse Element is provided with Two Explosion Chambers, into which all liquid metal and metallic vapours are blown and condensed.

Impossible for the Arc to Burn the Contacts or Terminals.

Impossible to Touch any Live Metal whether the fuses are in or out.

All Contacts are Clamped Direct to the Bus Bars.

All the Terminal Contacts are Clamped on a Steel Bar insulated with moulded Mica.

All the Contacts and China are supported and carried by the Bus Bar and Insulated Bar. No Screws whatever are required.

MADE IN THREE SIZES.

30 AMPS. 60 AMPS. 120 AMPS.

Larger Sizes in course of construction.

OUR DESCRIPTIVE CATALOGUE IS YOURS FOR ASKING. WRITE NOW.

Its ORIGINALITY and SIMPLICITY are PROTECTED by SEVERAL PATENTS that are **BEYOND REPUDIATION.**

WM. SANDERS & CO.,

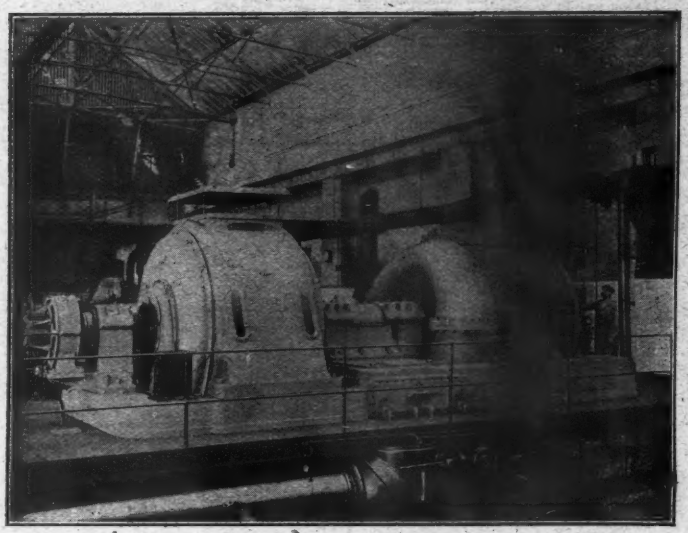
FALCON ELECTRICAL WORKS, WEDNESBURY.

'Phone: 65 Wednesbury. Wire: Sanders, Wednesbury.

VICKERS LIMITED.

Turbo-Alternators. Rotary Converters.

Complete equipment for the electrical lighting and driving of Machine Shops, Factories, Mills, &c.



Motors and Generators of all Types.

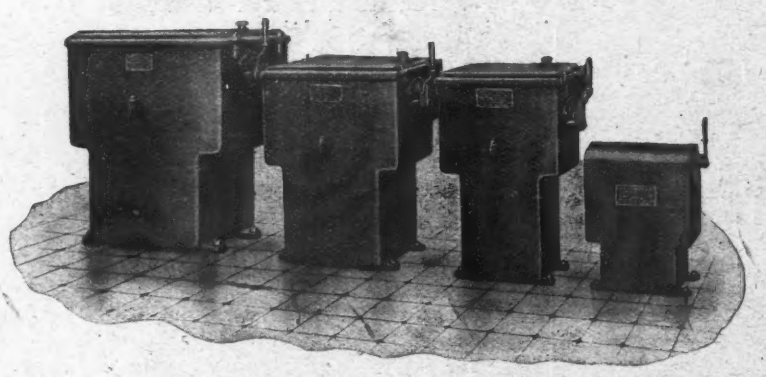
Patent Automatic Reversing Drive for Machine Tools.

Vickers Three-phase Turbo-Alternator, 5,000 K.W. 1,500 r.p.m., 6,600 volts.

River Don Works.
Sheffield.

AUTO-TRANSFORMER STARTERS

FOR INDUSTRIAL PURPOSES



DISTINCTIVE FEATURES.

Both transformer and switch oil immersed.

Contacts clamped on mica insulated steel bars.

Contact fingers easily renewable.

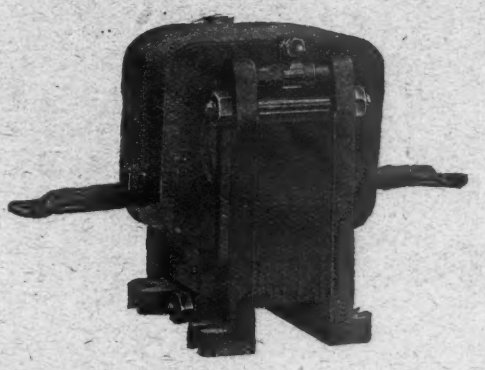
Transformer tappings accessible when cover removed.

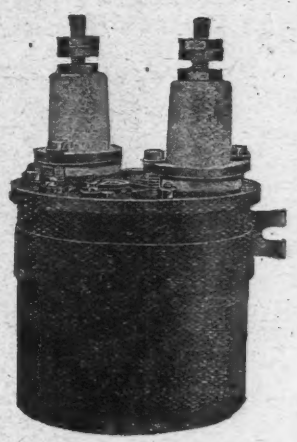
No-volt release fitted as required.

J. H. Holmes & Co., *Newcastle-on-Tyne.*

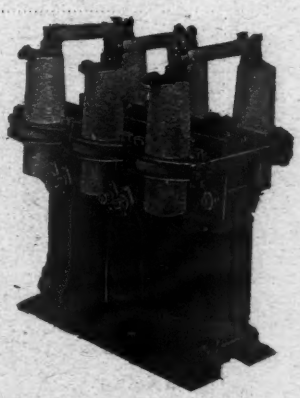
NEWCASTLE-ON-TYNE (Works) Portland Rd.		"Holmes, Newcastle-on-Tyne"	809 Central.
LONDON	17, Soho Square, W.	"Vermilionette, London"	1228 Gerrard.
MANCHESTER	Examiner Buildings.	"Compound, Manchester"	25 City.
GLASGOW	19, Waterloo Street.	"Efficiency, Glasgow"	1626 Central.
LEEDS	63, Albion Street.	"145 Central, Leeds"	145 Central.

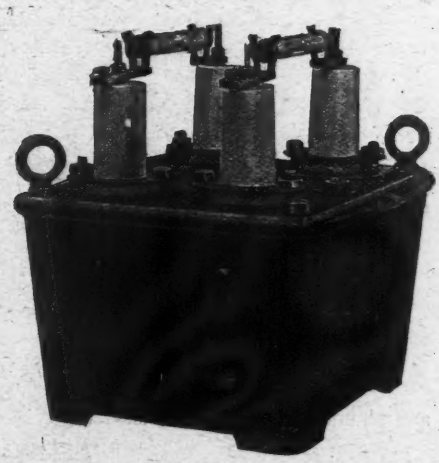
FERRANTI





CURRENT TRANSFORMERS.





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Telegrams: "Ferranti, Hollinwood." Telephone: Failsworth 31, 48, 112 & 120.

The War
and
"Le Carbone" Brushes.

"Are you able to continue to supply us with Le Carbone Brushes."

"Yes."

This affirmative answer has greatly eased the minds of all our customers.

You can appreciate the full meaning of this statement only by the use of Le Carbone brushes on your machines—the use of a brush of absolute uniformity which will give you long and efficient service.

Le Carbone,
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METAL FILAMENT LAMP

Manufactured only by the All-British Lamp Company,

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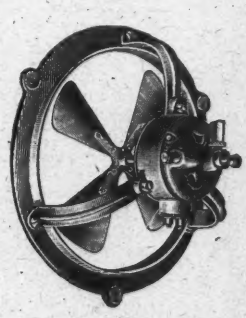
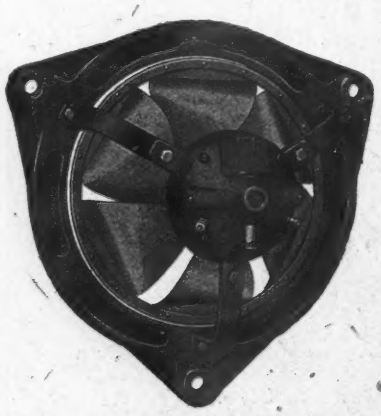
For
Efficiency, Economy, Endurance.

SUN FANS

are manufactured in all standard types from small desk fans to exhaust fans capable of moving up to 20,000 cubic feet of air per minute. The types illustrated are built in sizes adaptable to rooms and buildings of any size. They run absolutely silently and ensure a constant supply of pure air.



RING TYPE.
Made in 12 in. and 16 in. sizes for both A.C. and D.C. in all standard voltages.



BOX BLADE TYPE.
Made in 10 sizes for D.C., 12 in. to 60 in. diam., and in 8 sizes for A.C., 12 in. to 48 in. diam.

List No. 276 shows a representative selection of these excellent fans and will be sent post free on request.

The SUN ELECTRICAL COMPANY LIMITED

118-120, CHARING CROSS RD., LONDON, W.C. 2

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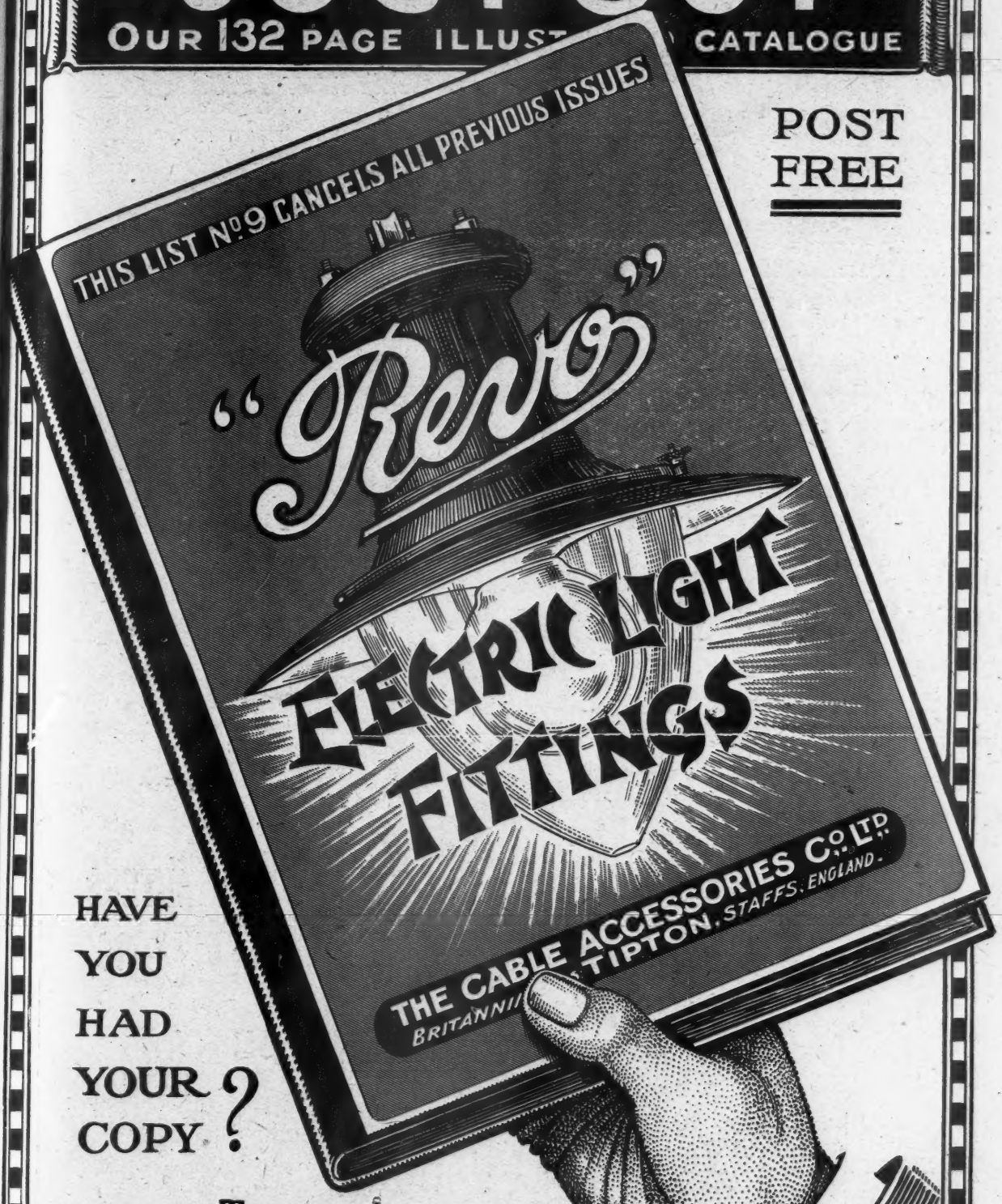
OUR 132 PAGE ILLUST[RATED] CATALOGUE

POST FREE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ELECTRIC LIGHT FITTINGS
THE CABLE ACCESSORIES Co. LTD.
BRITANNIA TIPTON. STAFFS. ENGLAND.

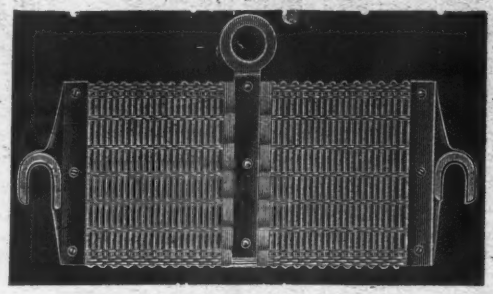
HAVE YOU HAD YOUR COPY?

THERE IS A "Revo" DESIGN for EVERY PURPOSE.

THE CABLE ACCESSORIES Co. LTD.
TIVIDALE, TIPTON, STAFFS

Controller Resistance Nets.

(BRITISH MADE.)



Dimensions: 6½ × 8 inches.

Can be SUPPLIED WITH or WITHOUT FIXING LUGS.

Standard Sizes with 80 to 5 ohms, each capable of carrying from 2½ to 8 amperes (3-minute rating), 1½ to 6·3 amperes (continuous rating).

EVERY KIND OF RESISTANCE MATERIAL SUPPLIED,

ALSO

Resistance Wires, Insulating Beads, Asbestos Yarns.

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THE CRESSALL MANUFACTURING CO.,

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BIRMINGHAM.

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TUBE OF LIGHT

THE SCIENTIFIC SYSTEM OF ELECTRIC LIGHTING

ARTISTIC WINDOW LIGHTING,

WITH METAL FILAMENT LAMPS.

TUBOLITE does not project into the space required for goods, nor does it throw a glaring light in the direction of the street. The window display is shown to the best advantage in a clear well-diffused and attractive light. The specially-designed reflector increases the useful light by 50 to 100 per cent.
Made in several patterns to suit various requirements.

We are now supplying 10-INCH LAMPS as well as our standard lamp 8½ ins. long.

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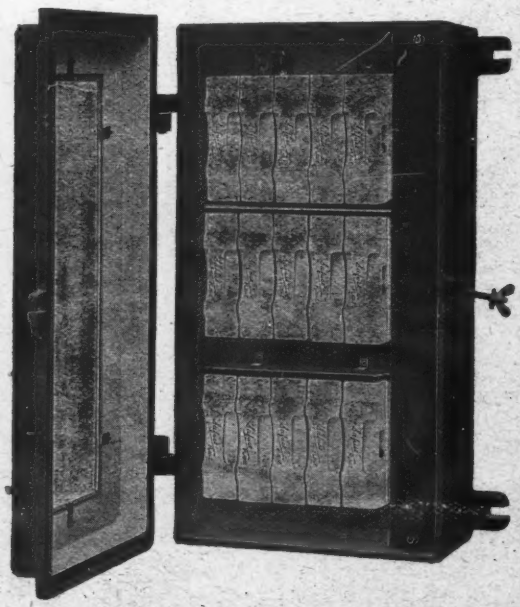
Complies with all the latest Home Office Regulations.



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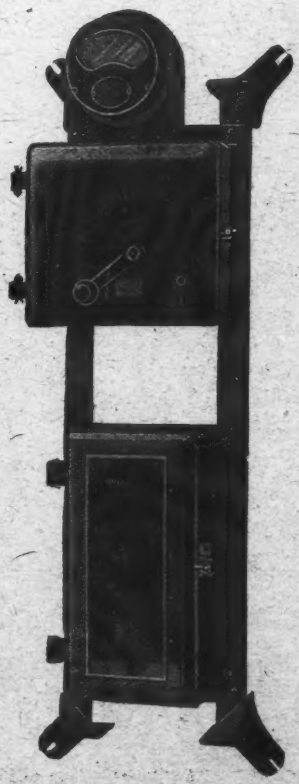
and

PANELS.



Strong,
Reliable,
Efficient,
Cheap.

Made to comply with Home Office Requirements.

Write for List.

DONOVAN & CO.,

Electrical Manufacturers,

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IMPROVED "VERTICAL" AND "TRACTION" TYPE

CIRCUIT BREAKERS

FOR ALTERNATING AND CONTINUOUS CURRENT UP TO 700 VOLTS.

The Special Features of these Breakers are:—

1.—All parts are perfectly standardised and completely interchangeable.

2.—The breaks are exceptionally long and quick.

3.—All contact parts are readily renewable.

4.—The carbon arcing contacts are the self-cleaning sliding contact type, and rapid closing cannot damage.

5.—Only one shape and size of carbon is used throughout, and the number employed is proportional to the current.

No. 1 SIZE.

Single-pole Open Type Breaker, with Standard Bell Contactor, to close simultaneously with Breaker. Straight Type Handle and Overload Release.

6.—Good copper to copper contact is maintained at adequate sparking tips while the brush is leaving the contact block, and pitting cannot occur.

7.—The contact surfaces and cross-sections are ample.

8.—All live parts of the Breakers are insulated from the frames, levers and adjustment tubes.

9.—Adjustable Time Lags are fitted when required.

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MANUFACTURED IN LONDON BY
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CIRCUIT BREAKERS WITH THERMAL OVERLOAD RELEASE.

OVERLOAD AND NO-VOLTAGE TYPE.

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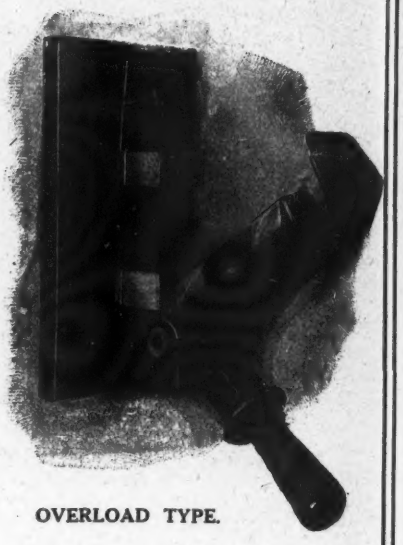

OVERLOAD TYPE.

THE GENERAL ELECTRIC COMPANY, Ltd., beg to announce that they have purchased the patent and manufacturing rights for Circuit Breakers of Messrs. Morris & Lister, Ltd., of Coventry.

Enquiries and orders for the **MORRIS & LISTER PATENT CIRCUIT BREAKER,** which will now be known as the **"WITTON" M.L. TYPE,** will receive their best attention if sent to any of the Company's branch offices, as follows :—

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(UNIVERSITY OF MANCHESTER).

PRINCIPAL: J. C. M. GARNETT, M.A. (late Fellow of Trinity College, Cambridge).

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MECHANICAL ENGINEERING,
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THE TEXTILE INDUSTRIES,
PRINTING AND PHOTOGRAPHIC TECHNOLOGY,
MINING,
ARCHITECTURE.

Intending students may enrol for the Session 1917-18 from 1st August, 1917. Members of the University under 18 years of age are eligible for membership of the Officers' Training Corps. 7933

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THE LONDON TELEGRAPH TRAINING COLLEGE, LTD.

(EST. 24 YEARS.)

THERE is at the present time a large demand for well-trained youths in the ARMY, NAVY, and private CABLE and WIRELESS TELEGRAPH COMPANIES. Wireless Telegraph Operators are in a certified occupation.—Apply for Prospectus to DEPART. R, 262, Earl's Court Road, S.W. 5. 7602

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If letters are not to be delivered to certain firms or individuals (if known), instructions to that effect should be sent to the Manager of the ELECTRICAL REVIEW, who will do his best to carry out such instructions. Letters of applicants cannot in such cases be returned to them, nor can the names of Advertisers using a number in any way be disclosed.

Original Testimonials should never be sent.

TELEPHONE FAULTSMEN WANTED.

A1 TELEPHONE FAULTSMEN required at once to inspect, repair and maintain several thousand private telephones in London area.

None but men experienced in the maintenance and repair of Intercommunicating Telephones need apply.

Applications may be made personally or by letter with references and full particulars. No applications will be considered from men at present engaged on Government work or resident more than 10 miles from London. Good terms for suitable men.

THE NEW SYSTEM PRIVATE TELEPHONE CO., LTD.,
143/145, Great Portland Street, W. 1. 7607

REDDITCH U.D.C. ELECTRICITY WORKS.

WANTED immediately, Two Stokers for Babcock Boilers fitted with Chain-Grate Stokers. Wages 10½d. per hour, including War Bonus. Applicants must be ineligible for Military Service and must be able to obtain a Leaving Certificate.

Apply, stating age, experience, &c., to the undersigned,

R. N. MAYNE,
Engineer and Manager.

Electricity Works,
Redditch, Worcester.
June 13th, 1917. 7868

UNIVERSITY COLLEGE, NOTTINGHAM.

Department of Engineering.

A LECTURER in Electrical Engineering is required to commence work in September. The appointment will be for the duration of the war, and will be reviewed on its termination.

Full particulars concerning salary, &c., and forms of application may be obtained from

J. E. SHIMELD,
Acting Registrar. 7959

Cheap prepaid Advertisements are inserted under this heading at the rate of One Penny Per Word (minimum 1s.). Three Consecutive Insertions for the price of two, if ordered and prepaid with first insertion.
Box Number and ELECTRICAL REVIEW address count as seven words.

A FIRM of electric dynamo and motor manufacturers, doing war work, have room for an apprentice.—Apply WOOLNOUGH, LANG, LTD., Wales Farm Road, Acton. 7867

ASSISTANT Engineer required for Central Station, West London, experienced in H.T. and D.C. maintenance. Duration of war or longer. Commencing salary, including war bonus, £176 and residence.—7964, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

ASSISTANT required, used to mains testing, fault finding, &c.; experience with distribution and meter work preferred. Also Electrician-in-Charge, or man with switchboard experience. Applicants must be over miltary age or of low medical category.—Apply by letter to NORMAN STANILAND, Electricity Works, Hornsey, N. 8. 2531

ASSISTANT Works Manager required to take charge of electrical switchgear section of large manufacturing firm in Midlands. Good opening for progressive and energetic man. No person already on Government work will be engaged.—Apply to your nearest EMPLOYMENT EXCHANGE, Box No. 3355. 2523

CLERK required for Electric Cable Estimating. Previous experience not absolutely essential. Must be ineligible for military service. No person resident more than 10 miles away, or already engaged on Government work, will be engaged.—Write stating age, salary required and qualifications, 7947, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

DRAUGHTSMAN, for small electrical work, required immediately by a large firm of electrical engineers in West London, under Government control. Write stating experience, age, and salary required. No person resident more than 10 miles away, or already engaged on Government work, will be engaged.—7935, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

(Continued on next page.)

SITUATIONS VACANT.—*Continued.*

ELECTRICIAN-Wireman, good all-round, lighting, motors and tramcar wiring. No person on Government work, or eligible for Army will be considered.—2510, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

ENGINEER (ineligible) wanted for post of Manager and Secretary of supply company (temporary). Salary £181 per annum.—2458, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

EXPERIENCED Man for maintenance of electric motors. No person resident more than 10 miles away, or already engaged on Government work, will be engaged.—MARRYAT, 28, Hatton Garden, E.C. 1. 7944

EXPERIENCED Tester required by large firm of Electrical Contractors, ineligible for Military Service. No person resident more than 10 miles away, or already engaged on Government work, will be engaged. — 7949, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

FITTER and Turner, used to Tramway machine shop work. No person on Government work or eligible for Army will be considered.—2512, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

INSTRUMENT Maker, used to turning and fitting brass and ebonite parts to extreme accuracy, for responsible position on work of national importance; must be able to read drawing and use micrometer. Character must bear strictest investigation. Interesting work with good prospects for first-class mechanic; location, London, W. Anyone over ten miles away, or on Government work, need not reply.—Address M. M., c/o Dixons, 195, Oxford Street, W. 7902

JUNIOR Shift Engineer. Applications are invited for position as Junior Shift Engineer; workshop training essential; wages £2, plus 4s. bonus. Applications, giving particulars of training and reason for exemption, to be forwarded to the CHIEF ENGINEER, Electricity Works, 50, Eden Grove, Holloway, N. 7. 7848

MAGNETO Mechanic or Electrical Instrument Maker for responsible position in magneto factory under Government control; must be highly skilled and used to light repetition work of great accuracy; preference given to one who has been in business for himself. Anyone over 10 miles away, or on Government work, need not reply.—Address "M. M.," c/o Dixon's, 195, Oxford Street, W. 1. 7860

MECHANICAL Draughtsman required for Works Engineering Department of a large factory near London; some knowledge of building construction essential; permanent position for suitable man. No person already engaged on Government work, or residing more than 10 miles away, need apply, stating age, salary, and full details of experience, to Box 105, c/o Mitchell's Advertising Agency, 1, Snow Hill, E.C. 1. 7941

REQUIRED immediately for Controlled Engineering Works, S.E. London, Draughtsman (Mechanical or Marine); Ditto (with knowledge of estimating weights of castings); Drawing Office Clerks (one male, one female). Junior applicants must have had several years' experience. No applicants residing outside radius of 10 miles, or already employed on Government work, can be engaged.—Write stating age, experience and salary required, to 7927, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

RESIDENT Engineer and Secretary required at once, for small direct-current central station, situated in a seaside town, West of England. Applicants must have had good electrical and commercial experience, and be conversant with suction gas plants, and general wiring business.—Full particulars of past experience and present position, with salary required, to 7883, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

SHED-Hand used to Tramway work. No person on Government work or eligible for Army will be considered.—2511, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

SHIFT Engineer wanted, must be ineligible, small station D.C. 3-wire, able to do running repairs.—Apply stating experience, wage required, and when able to commence, to 2526, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

SHIFT Engineers wanted in certified undertaking; H.T. A.C. turbine experience and good mechanical training essential.—Apply stating age, full qualifications, wage required, &c., and when able to commence, to THE SCOTTISH CENTRAL ELECTRIC POWER CO., 1, Kirk Wynd, Falkirk. 7912

SILUMINITE (See advertisement May 25th, 1917). Selling Agents wanted in chief towns except Birmingham and Manchester. Applicants please send full particulars and qualifications.—SILUMINITE INSULATOR CO., LTD., The Green, Southall. 7846

SITUATIONS VACANT.—*Continued.*

SWITCHBOARD Attendant wanted (ineligible) to take 8-hour shifts. System, 3-wire D.C. with battery.—Applications stating experience and salary required to the ENGINEER, Electricity Supply Corporation, 93, High Road, Chiswick, W. 4 7950

SWITCHBOARD Attendants, ineligible, with experience in A.C., E.H.T. and D.C. stations.—Apply with full particulars of experience, enclosing copies of testimonials, NORTHAMPTON ELECTRIC LIGHT AND POWER CO., LTD., 25, Bridge Street, Northampton. 7962

TELEPHONE Mechanics, bench hands, assemblers; also Electrical Testers, war work. Released men given the preference. Permanent. Good wages; London Works.—7958, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

WANTED, a Man capable of carrying out repairs to railless cars; electrical knowledge of secondary consideration compared to mechanical experience. One accustomed to petrol vehicles would be trained in the electrical portion of the work.—7952, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

WANTED, by a firm in the S.E. district engaged on munition work, first-class Telegraph Mechanics. No person resident more than 10 miles away, or already engaged on Government work, will be engaged.—State age and experience to 6125, ELECTRICAL REVIEW, 4, Ludgate Hill, London

WANTED, competent working Colliery Electrician, thoroughly experienced in three-phase high-tension Plant. — 7926, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

WANTED, Draughtsman for the mechanical design of large electrical direct current machines. Nobody engaged on Government work will be accepted.—Write or apply to the nearest BOARD OF TRADE EMPLOYMENT EXCHANGE, mentioning this paper and No. A2631. 7346

WANTED, Electric Cable Jointer's Mate, for work in the Barnet district.—Apply, ELECTRIC LIGHT CO., 41, High Street, High Barnet. 2527

WANTED, for generating station in Manchester district, Switchboard Attendants (ineligible for Army), or men with electrical experience willing to be trained as such. Good wages.—Apply stating age, experience, and when at liberty, 7841, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

WANTED in London, the assistance of Superintendent or Workman in spare time, in carrying out experiments in manufacture of pressed and moulded electrical insulations material; must have good knowledge of such work. No person resident more than 10 miles away, or already engaged on Government work, will be engaged.—Write G. C. R., c/o Dawson's, 121, Cannon Street, E.C. 4. 2532

WANTED, invalided young officers with electrical experience willing to act as Switchboard Attendants in a generating station. Good salary.—7661, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

WANTED, one or two Draughtsmen with experience in civil and mechanical engineering work, in connection with layouts for electric power stations; also Assistant to act as clerk of works.—Particulars of experience, age, salary required, to THE YORKSHIRE ELECTRIC POWER COMPANY, Wellington Road, Dewsbury. 7942

WELL-KNOWN electric motor firm require Representative with first-class connections. — Apply in confidence to 7929, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

WIREMAN, good all-round man, ineligible, used to lighting motors, telephones and bells, &c. No person on Government work will be engaged.—Apply giving full particulars, to your nearest EMPLOYMENT EXCHANGE, mentioning No. A2983. 7189

WORKING Manager to carry on old Electrical Contractor's Business while owner on Service. Applicants must be over military age, and have thorough practical experience of installation and maintenance work, and capable of interviewing and estimating; or would entertain offers to purchase business.—2440, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

APPOINTMENT FILLED.

7825, June 8th.—Shift Engineer.—The advertisers beg to thank applicants for their communications, and to announce that the vacancy is now filled. 7943

(Continued on next page.)

SITUATIONS WANTED.

Cheap prepaid Advertisements are inserted under this heading at the rate of One Penny Per Word (minimum 1s.). Three Consecutive Insertions for the price of two, if ordered and prepaid with first insertion.
Box Number and ELECTRICAL REVIEW address count as seven words.

APPLICANT requires position as Works Manager or Superindent in electric cable works. Own cheap rubber, bitumen, and gutta-percha mixings. Can manufacture and estimate for everything in the above business. Military exempt.—2549, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

COLONIAL.—Salesman (51), energetic, with engineering, cable and accessories knowledge and past colonial experience, is desirous of representing British manufacturer in Africa or Australia; highest references.—2505, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

ELECTRICAL Engineer desires position as substitute. London. Good commercial, drawing, estimating. Experience power-lighting installations.—2553, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

ELECTRICAL Engineer, ineligible, experienced central station management, mains and installation, desires responsible permanent position.—2481, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

ELECTRICAL Engineer seeks position. Until recently on electrical instruments of highest importance for Government.—2538, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

ELECTRICAL Engineer (44), 14 years' experience of installation and maintenance work, and ten years as Electrical Surveyor with leading insurance companies; wide knowledge of special service work; salary required £250 per annum.—2529, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

ELECTRICAL Engineer (47), nine years high explosives and chemical factories, home and abroad, capable in erection and maintenance, 30 years' general electrical experience.—2486, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

ELECTRICAL Engineer (47) wants charge small central station or large estate.—2509, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

ELECTRICAL Foreman Engineer, thoroughly experienced; plant, power, erection, lighting, &c.; installations, estimating; over 20 years' practical experience.—2459, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

ELECTRICIAN and Mate wants piece work or contract, light, bells, 'phones, motors.—COWLING, 95, Chatsworth Road, Clapton. 2540

ELECTRICIAN, light, bells, 'phones, jobbing or new. Ineligible.—E., 109, Cornwall Road, W. 11. 2552

ELECTRICIAN, working foreman; estimating, supervising, every branch. Plant, power, distribution, mains; highest references.—6, Bickerton Road, Highgate, N. 19. 2556

ELECTRICIAN - Wireman (young), rejected. Lifts, lights, Motors. Some mechanical experience.—40, Rowfant Road, S.W. 17 2551

ENGINEER (ineligible) mechanical, electrical, seeks responsible post, clerk of works or charge, wide experience, erection, maintenance and central station, control of men.—References, A. G., 94, Shrewsbury Road, Forest Gate, E. 7 2468

ENGINEER, life experience steam, gas or oil, requires charge of country house installation; 20 years' testimonials from one estate, two years' war service.—NICHOLLS, Power House, R.N.D. Camp, Blandford. 2497

GRADUATE, with extensive experience design, manufacture and installation of electrical apparatus for collieries, factories and warships, desires engagement on National work. Age 35, ineligible. Salary, £500.—2483, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

TWO Electrician-Wiremen disengaged; all-round experience; Government work only; anywhere; London rates.—TURNER, 11, Park Road, Hounslow. 2555

PARTNERSHIP.

Cheap prepaid Advertisements are inserted under this heading at the rate of One Penny Per Word (minimum 1s.). Three Consecutive Insertions for the price of two, if ordered and prepaid with first insertion.
Box Number and ELECTRICAL REVIEW address count as seven words.

POCKET Lamp Batteries. Advertiser, expert in the manufacture of all kinds of Dry Batteries, wants reliable firm or person to form company to make batteries for pocket lamps, torches, bells, telephones, &c.; enormous sales, large profits; or otherwise would sell formulas.—2489, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

AGENCIES.

Cheap prepaid Advertisements are inserted under this heading at the rate of One Penny Per Word (minimum 1s.). Three Consecutive Insertions for the price of two, if ordered and prepaid with first insertion.
Box Number and ELECTRICAL REVIEW address count as seven words.

A LONDON Firm of Wholesale Suppliers requires the services of live Representatives in various parts of the country to take up the sale of some special lines in Lighting Accessories and Electrical Novelties. Applicants must have first-class connection in the trade, and be able to influence business amongst large contractors and retailers of electrical goods.—2467, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

ENGINEER, about to open establishment specialising in repairs to all kinds of electrical machinery and appliances, desires to communicate with agents who can introduce suitable business.—2542, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

FOR SALE.

Messrs. THE BRITISH ELECTRICAL SUPPLY STORES
Transfer Works,
WHITLEY BAY, Northumberland.
Telegrams: "Transfer," Whitley Bay.

ELECTRICAL PLANT FOR SALE.

FOUR 375-KW. Williams-Siemens Sets. Engines, three-crank, triple expansion, built for 180 lbs. steam pressure, installed between 1897 and 1899.
Two similar but with E.C.C. Dynamos, installed in 1901. All generators can be run either as shunt (460/500-volt) or compound (500/550-volt) wound generators, and are complete with field rheostats, &c.
Two Surface Condensers by Cole, Marchent & Morley, each containing 2,500 square feet cooling surface.
Two Compound steam-driven Air Pumps, capacity suitable for working with one of above condensers.
Two, exactly alike, 100-KW. Steam Generating Sets, 460 volts, D.C. Generators (Mawdsley), complete with switchboard, cable, and boilers.
Three 140-H.P. Scott & Mountain 8-pole D.C. Motors, 500 volts starter, pulleys and rails. Speed 555 R.P.M.
One 80-H.P. Gas Engine, magneto ignition; make, National.
One 25-H.P. D.C. Siemens protected type Motor, shunt wound; speed, 900 R.P.M. approximately, 400 volts.
Two, exactly alike, 100-H.P. Crossley Suction Gas Engines, direct coupled to two Lancashire Dynamos, 550 volts, 120 amps., 200 R.P.M., 2 complete sets Gas Generators for 100 H.P. complete with switchboard. Immediate removal.
One Tram Type 20-H.P. Controller, crane rated.
One Dynamo, 120 volts, 25 amps., complete with switchboard.
One 10-H.P. (Flathers), 200-volt, 2-phase, 1440 R.P.M., 28 amps., 50 periods, slide rails, pulley and starter.
Three 80-H.P. Siemens A.C. Motors.
One Allans Steam Generating Engine, extended box bed for generator compound, 70 I.H.P., perfect condition, cheap quick sale
Two 3-H.P., D.C., 240-volt, 4-pole, shunt-wound Motors, switchboards and pulleys.
One 35-H.P., D.C., 4-pole, enclosed, 500-volt Motors, 500 R.P.M., spare armature, complete.
One 28-H.P., D.C. Motor, 460 volts, make Brush Electrical Co.
One 40-H.P. Motor, 3-phase, 440 volts, 40 cycles, slip ring, complete regulator, make Mather & Platt, no starter.
One 2000-KW., Willans-Bruce Peebles, 6000-volt, 3-phase, 40-period Turbo-Generator, fitted with surface condenser.
One Westinghouse 40-H.P. Motor, 200 volts, 50 cycles, 710 R.P.M.
All Electrical Plant is tested by a well-known Insurance Co. 7120

GENERATING SET FOR SALE.

ONE Generating Set, comprising:—

Browett & Lindley compound engine for 120/160 lbs. steam pressure non-condensing direct coupled to G.E.C. 3-phase alternator, having an output of 220 KW., at 500 volts, 50 cycles, complete with direct coupled exciter, also switchboard.

Above represents opportunity of securing good modern plant at a reasonable figure.

Full specification and price on application to

THE PHŒNIX ELECTRICAL CO.,
32—36, Broomielaw,
Glasgow. 7940

(Continued on next page.)

FOR SALE.—*Continued.*

FOR SALE.

50-KW. Generating Set, engine by Davey Paxman & Co., direct-coupled to E.C.C. Dynamo, 220 volts, 230 amps., 560 revs.
50-KW. Steam Generating Set, direct-coupled to Dynamo, 500 volts, 100 amps., 500 revs.
Two Electric Locos., 2 ft. 6 in. gauge ; capacity 30/35 tons on the level at a speed of 5/6 miles per hour, 500/600 volts.
Self-contained Sandycroft Hoisting Engine, 7-in. cyls., 12-in. stroke.
Hori. Cond. Engine, by Marshalls, with cyl. 16-in. dia. by 33-in. stroke.
Vert. Comp. Corliss Cond. Engine, by Goodfellow, 13-in. and 24-in. cyls., 24-in. stroke.
Two Vert. Comp. Engines, by The Brush Co., with cyls. 8-in. and 15-in. dia. by 10-in. stroke.
Three Cross Comp. Hori. Engines, by Robey & Co., with 8½-in. and 14¾-in. cyls., by 16-in. stroke.

CATALOGUE of Stock MACHINERY. 2-3000 LOTS.
Free on Application. Inspection invited.

THOS. W. WARD, LTD., ALBION WORKS,
Tel. : "Forward, Sheffield." SHEFFIELD.

R. H. LONGBOTHAM & CO., LTD., WAKEFIELD,
and at Milburn House, Newcastle-on-Tyne.

Tel : { 44 Wakefield. / 867 Newcastle. Telegrams : "Engineer, Wakefield."

FOR SALE.

ONE Generating Set. 600-KW. Generator by Parkers, 500 volts, D.C., ; Engines by Belliss & Morcom, Ltd. ; Cylinders 16½" × 23" × 42" stroke. Complete with surface condenser, motor-driven air and circulating pumps.
350-KW. Alternator, by the B.T.H. Co., 550 volts, 3-phase, 50 cycles, with Barclay's cross compound horizontal Engines, 26" and 40" cyls. × 4-ft. stroke.
Generating Set, 125 KW., with 250-H.P. vertical Cross Compound Condensing Engine by J. & H. McLaren ; Alternator by Ferranti, 2,000 volts, 50 periods.
Two motor-driven Air Compressors, by Reavell, capacity 320 cub. ft., with 65-H.P. Westinghouse Motors, 440 volts, 3-phase, A.C.
Waddle Patent Fan, capacity 20,000 cb. ft., with Motor, 550 volts A.C., 25 H.P.
Mirrlees-Watson Condenser ; 30,000 lbs. steam per hr. ; 3,000 sq. ft. cooling surface. With separator. 5277

FOR SALE.

Urban District Council of Dartford.

OFFERS are invited for one Ledwards Evaporative Condenser (10,000 lbs. of steam per hour) with air pump.
The plant can be inspected by appointment on application to Mr. J. D. PEMBER, Engineer and Manager, Electricity Works, Priory Road, Dartford, from whom a short specification and form of tender can be obtained.
Sealed offers, in envelopes endorsed "Tender for Plant," must be delivered at the Council Offices, Dartford, not later than noon on JULY 12th.

W. KAY,
Clerk to the Council.

Council Offices, Dartford.
16th June, 1917. 7898

FOR SALE.

ONE Crossley "Z.A.E." Type Gas Engine, 140 B.H.P. on town's gas, 119 B.H.P. on producer gas, 200 R.P.M., complete with small engine and air-compressor for starting. Engine No. 54666.
One 200/220-volt, 400-ampere, 550-R.P.M., 6-pole Generator, by Mawdsleys, Ltd.
The whole forming a very fine up-to-date plant in first-class order.

Price £750 nett, f.o.r. Leicester.

THE PHŒNIX ELECTRICAL CO.,
32—36, Broomielaw,
Glasgow. 7806

TWO Dynamos, 900 amps., 110 volts, 450 R.P.M.
One Battery, 37 cells, 7-plate Chloride.
One Dynamo for charging above.
One Switchboard for above.
One 5/6-H.P. Motor, 460 volts, B.T.H.
One 6-KW. Dynamo, 110 volts, Barton.
One 6-KW. Dynamo, 110 volts, Holmes.
One 9-KW. Dynamo, 110 volts, Crompton.
One 24-KW. Dynamo, 220 volts, Royce.
Three ½-H.P. Motors, 220 volts, Siemens.
One 200-KW. Steam Turbine at 500 volts.
1·27-H.P. P.T. Motor, 440-volts, Barton.

7662, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

FOR SALE.—*Continued.*

GENERATING SETS FOR SALE.

ONE Generating Set, comprising Belliss compound Engine, direct coupled to a 6-pole shunt-wound Generator, by Mavor & Coulson, Ltd., having an output of 150 KW. at 110 volts, 435 R.P.M.

One Generating Set as above, but 70 KW., 110 volts, 450 R.P.M.

Both Sets are modern, and in first-class order.

THE PHŒNIX ELECTRICAL CO.,
32—36, Broomielaw,
Glasgow. 7805

DYNAMO FOR SALE.

FOR SALE, owing to modification of power supply, one new 500-KW. Compound-wound 500-volt, 200-R.P.M. Dynamo, complete with outer journal bearing, half coupling, U base-plate and foundation bolts.

Delivery from stock at once.

Full Specification of construction and price on application to—

PHŒNIX DYNAMO MFG. CO.,
Thornbury Works,
Bradford.
7960

FOR SALE.

ONE Sulzer 3-stage Mining Pump, horizontal, 11" suction, 11" discharge, 1,500 gallons per minute, 650 ft. vertical lift ; phosphor bronze impellers, coupled to 500-H.P. motor, 3-phase, 500 volts, 50 periods ; cable, panel, liquid starters. Equal to new.
Two horizontal 3-throw Mining Pumps, Frazer & Chalmers. Gun metal rams, 6¾" diameter, 1,000 gallons per minute, 650 ft. vertical lift ; coupled to 175-H.P. motors, 3-phase, 500 volts, 50 periods ; panels, liquid starters, cable. Equal to new.
Motor Generator, 4-pole, shunt wound, 400 volts, 850 revs., coupled to generator, 4-pole, shunt wound, 230 volts, 100 amps., 850 revs. ; starting switch and rheostat ; Lancashire Dynamo Co. Equal to new. Seen Manchester.
One Switchboard ; four polished slate panels, 8 ft. long by 5 ft. ; 27 power and lighting switches, 2 ammeters, 150 amps., 1-300 amps., and fuses. Seen Manchester.

THOS. OXLEY, LTD., 'Phone : 4630 (6 lines).
Shiloh Works, Telegrams : "Ironical,
Sheffield. Sheffield." 7951

A.C. MOTORS.

550-H.P., 400 volts, 365 revs., 3-phase, 50 cy.
350-H.P., 500 volts, 480 revs., 3-phase, 50 cy.
300-H.P., 420 volts, 480 revs., 3-phase, 50 cy,
275-H.P., 400 volts, 385 revs., 3-phase, 40 cy.
50-H.P., 400 volts, 720 revs., 3-phase, 50 cy.

D.C. MOTORS.

40-H.P., 230 volts, 650 revs., shunt-wound.
20-H.P., 220 volts, 1190 revs., shunt-wound.
19-H.P., 230 volts, 700 revs., shunt-wound.
17-H.P., 220 volts, 550 revs., compound-wound.
16½-H.P., 230 volts, 600 revs., shunt-wound.
4½-H.P., 220 volts, 850 revs., shunt-wound.
3-H.P., 210 volts, 1250 revs., shunt-wound.

C. L. TURNER, 49, Deansgate, Manchester. Tel. 1603 City. 2543

ERITH U.D.C.

THE ERITH URBAN DISTRICT COUNCIL are prepared to consider offers for the purchase of :—
One "Bettington" type Water-Tube Boiler, evaporative capacity 10,000 lbs., at 160 lbs. working pressure, with all accessories, in excellent working condition.
Purchaser to bear cost of dismantling and removal.
Offers to reach the undersigned, from whom all particulars may be obtained, not later than JULY 28th.

JOHN CHARLES WILLIAMS, A.M.I.E.E.,
Engineer and Manager,
Walnut Tree Road, Erith. 7956

(Continued on next page.)

FOR SALE.—*Continued.*

ELECTRIC MOTORS.

SALE or hire. Second-hand Machines in stock. ARMATURES and Coils repaired at shortest notice.

THE TITAN ELECTRICAL CO.,
9/11, Eagle Street, W.C.
'Phone: Central, 13,191. 6493

Cheap prepaid Advertisements relating to second-hand goods and specified Articles are inserted under this heading at the rate of One Penny Per Word (minimum 1s.). Three Consecutive Insertions for the price of two, if ordered and prepaid with first insertion.

TRADE RATES ON APPLICATION.

Box Number and ELECTRICAL REVIEW address count as seven words.

A NUMBER of Moving Coil Voltmeters and Ammeters, 6" and 8" dials, in good order; quantity of Simplex fittings, elbows, tees, &c.; also a quantity of Empire tape.—39, Walsden Street, Clayton, Manchester. 7939

A.C. Motors, Sale or Hire.—10 H.P., 3-phase, 200 volts, 50 cycles; 6 H.P. ditto; 6 H.P., 400 volts. Single-phase Motors, 3 H.P., 200 volts, 90 cycles; 5 H.P., 110 volts, 50 cycles; 1 H.P., 1½ H.P., 2 H.P., 9 H.P., all 200 volts, 50 cycles; ½ H.P., three-phase, 420 volts, 50 cycles.—E. P. ALLAM & Co., 107, Gray's Inn Road, W.C. 1. 7936

CABLE, 110 yds., 7/20s twin paper-insulated, lead-covered, armoured, two layers steel tape, juted overall, new, £14.—CRAVEN ELECTRIC Co., Skipton. 2442

CASING and Capping (American Whitewood) for Sale; also Clearing Lines.—THE WEST OF ENGLAND JOINERY CO., LTD., Plymouth. 2460

CONDUIT Fittings, screwed and slip, 50% off list.—TURNER, 25, Station Road, Willesden Junction. 2521

CROSSLEY Gas Engine, 8/10 H.P., electric light type, two fly-wheels, tube ignition, works No. 29056; and Crompton Dynamo, 110 volts, 45 amps., works No. 3700. Been used as stand-by set in flour mill when main engine stopped. Only run intermittently and in good order. Would sell engine separately. Cheap.—Apply, SHAW, 66/68, Brook Street, Hull. 2488,

D.C. Motors, Sale or Hire.—530 volts, 1½ H.P., 2½ H.P.; 480 volts 1½ H.P., 2½ H.P., 3 H.P., 5 H.P., 6 H.P., 10 H.P., 20 H.P.; 400 volts, 2 H.P., 3 H.P.; 200 volts, 1 H.P., 1½ H.P., 2 H.P., 3 H.P., 5 H.P., 10 H.P., 20 H.P.—E. P. ALLAM & Co., 107, Gray's Inn Road, W.C. 1. 7937

DYNAMO, four-pole, compound-wound, 100-volt, 250 amperes, new, as delivered, £105. Motor, 20-B.H.P., 460-volt D.C. Interpole, with Igranic starter complete as new, £70. Dynamo, Crompton bi-polar 100-volt, 200 amperes with slide rails, and pulley and regulator compound wound, £35.—Apply ALLANS, Bridgewater Street, Wapping, Liverpool. 2478

DYNAMOS, 3000, 1500, 1000 and 750 amperes at 6 volts; also smaller sizes. Machines let out on hire.—CANNING & Co., Electro-Platers Engineers, Birmingham. 7769

EIGHT, 12, 17 and 27-H.P., 110-volt, shunt-protected Motors. All in sound running order.—DRUMMOND & Co., Commercial Street, Middlesbrough. 7873

ELECTRIC Motors and Dynamos, Sale or Hire. Always a large stock of nearly new guaranteed machines. Immediate delivery.—ELECTRO-GENERATOR Co., 1A, Shepherd's Bush Road, W. 'Phone: 488 Hammersmith. 2530

ELECTRIC Motors.—Large selection, new and second-hand, in stock for immediate delivery.—MALCOLM & ALLAN, LTD., 499, Eglinton Street, Glasgow. 2522

ENGINE and machinery-cleaning Waste, good quality, excellent value. Price 34s. 9d. per cwt., carriage paid, cwt. bales.—DUXBURY, Rag Waste Merchant, Nottingham Street, Bolton. 2461

FOR Sale, Electrically-Driven Three-Throw Pumps, 7 in. by 8 in. stroke, direct-coupled to 500-volt C.C. Motor.—WILLIAMS AND SONS, 37, Queen Victoria Street, London, E.C. 7882

FOR Sale or Hire, high class Dynamos, Motors, Alternators, Cable and Arc Lamps.—PERCY HUDDLESTON & Co., 72, Finsbury Pavement, E.C. 2455

FOR Sale or Hire, 1-H.P. to 30-H.P. Guaranteed Machines.—MACDONALD, SYER & Co., LTD., 295, Gray's Inn Road, W.C. 7883

FOR Sale (second-hand), immediate delivery, one marine type, slow-speed, Corliss valve Engine, coupled direct to 800 KW. D.C. electric generator, 1,250 volts.—May be seen working any day on application to C. NEWTON RUSSELL, Chief Electrical Engineer, Shoreditch Borough Council, Electricity Department, Coronet Street, Shoreditch, N. 7906

FOR SALE.—*Continued.*

FOR Sale, Stock of Working Electrician's Electric Light Fittings and Accessories, Bell Accessories, &c. One Lot or separate.—GRIFFITHS, "Oakdene," Woodgrange Avenue, North Finchley. 2513

FOR Sale, Surface Condensing Plant, by Wheeler, with vacuum gauge and two-throw steam driven Air Pumps, by Allen and Sons.—MADEN & MCKEE, LTD., 317, Prescot Road, Liverpool. 7870

FOR Sale, two 500-KW. Parsons Steam Generators, 500 volts, 180 steam pressure.—WILLIAMS & SONS, 37, Queen Victoria Street, London, E.C. 7880

FOR Sale, 5, 10, 20, 30, and 50-H.P., 2-phase A.C. Motors, complete with starter, slide rails and pulleys.; 1, 2, 3, 5, 15 and 25-H.P. D.C. Motors, 230—440-volt, complete with starter, slide rails and pulleys; D.P. and triple-pole switch and fuses, interlocking cases, H. O. pattern, 20 to 200 amperes capacity; several Generators, 100 volts—230 volts, all robust and first-class material, guaranteed for a period of 12 months exclusive fair wear and tear.—Apply "MACHINERY," 62, Bradford Street, Walsall. 7934

FOR Sale, 100-amp., 110-volt, three-bearing Generator; maker, Thomas Parker.—Apply B. FRENCH, Electrical Engineer, Kidderminster. 2435

FOR Sale, 120-KW. Steam Generating Set, 230 volts, 500 amps., 350 R.P.M.; immediate delivery.—WILLIAMS & SONS, 37, Queen Victoria Street, London, E.C. 7881

GAS-Oil Engines, 1 B.H.P., £7; 2 B.H.P., £8; 3 B.H.P., £10 10s.; 5 B.H.P., £12 10s. New; guaranteed. Also secondhand.—BINNS, 49, Ripon Street, Gateshead-on-Tyne. 2506

GENERATING Sets, two 375-KW., triple-expansion enclosed engine, 440/550 volts D.C.; one 275-KW. Willans-Westinghouse, A.C., three-phase, 50 periods, 2200 volts; Generator, 200-KW., compound, 500 volts; A.C. Motor, 40 periods, three-phase, 275-H.P. All immediate delivery.—JENNINGS, West Walls, Newcastle-on-Tyne. 7725

GENERATORS, 120, 250, 500, 1000 watts; ball bearings. New, guaranteed.—BINNS, 49, Ripon Street, Gateshead-on-Tyne. 2507

GENERATORS, 220-volt, 32, 40 and 50-KW., 10, 8 and 5-H.P. Motors, with Starters.—MARTINS, 320, Witton Road, Birmingham. 2545

LAMPS, Metal Filament, British made; 4800 250-volt, 32 C.P.; 1000 250/25 C.P.; at 1s. 4d. each to clear.—PATERSON AND SERVICE, 38, Bath Street, Glasgow. 7908

MARBLE Generator Panel with Wattmeter, highest class, 2000 amperes, 200/250 volts, all instruments and connecting cable; about 10,000 Carbons, mostly 13-m/m cored; quantity Heavy Dynamo Flexible, carrying 50/1000 amperes; Recording Voltmeters and Ammeters by Richard, Paris.—JENNINGS, West Walls, Newcastle-on-Tyne. 7726

MOTORS, D.C., new. Ball bearings, ¼-H.P., £5 10s.; ½-H.P., £8; 1-H.P., £10 10s.; 1½-H.P., £13 10s.; Starters, ¼ to 50-H.P., cheap.—BINNS, 49, Ripon Street, Gateshead-on-Tyne. 2508

OIL Engine, 16-H.P., Hornsby; Dynamo, 40 amperes, 220 to 280 volts; battery charging Switchboard; Oil Storage Tank, 800 galls.; or the whole complete plant.—JOHN RICHARDS & Co., 9, High Street, Burton-on-Trent. 2547

OVENS, Electric, Credenda and Dowsing, new.—Apply, JOHN RICHARDS & Co., 9, High Street, Burton-on-Trent. 2548

QUANTITY of Langdon-Davies, single-phase, 50-cycle Motors, 210 volts, 12 to 30 H.P., with starters.—MARTINS, 320, Witton Road, Birmingham. 2407

SHUNT-WOUND, 105/140-volt 110-amp. Dynamo, by Electric Construction Co., No. 6313, year 1901, carbon brushes, 570 R.P.M., weight about 35 cwt., price £55.—WILTS TOY CO., Radnor Street, Swindon, Wilts. 2554

THREE Steel Poles 25 ft. long by ¼ in. thick, £3 each.—THE LONDON ELECTRIC FIRM, Croydon. 7925

THREE 300-amp., 110-volt Dynamos, 700 R.P.M., compound wound.—MARTINS, 320, Witton Road, Birmingham. 2409

TRANSFORMER, Brush, 3-phase, 130 K.V.A., oil cooled, 6,600 volts to 400 volts, with neutral tapping, been used five years; offers invited without oil, f.o.r. near Bradford.—2475, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

TWO new Plating Dynamos, 1,000 amperes, 10 volts, 750 revs. per min.; one ditto, 1,250 amperes, 15/25 volts, 500 revs. per min.; from stock.—CUTTING BROS., LTD., Stamford. 7954

(Continued on next page.)

FOR SALE.—*Continued.*

TWO 7-H.P., 440-volt, compound, protected Motors by Electromotors, 450 revs. Perfect order. Ready for work.—DRUMMOND & Co., Commercial Street, Middlesbrough. 7876

TWO 50-H.P., 220-volt, series-wound Crane Motors, totally enclosed, by Westinghouse.—DRUMMOND & Co., Middlesbrough. 2535

TWO 114-KW., 240-volt multipolar shunt-wound Generators, three-bearing belt-driven type; also one 44-KW. ditto, compound wound. All ready for immediate use.—DRUMMOND & Co., Commercial Street, Middlesbrough. 7872

TWO 130-H.P., 210-V. Motors, 300 revs. (by Bruce Peebles) in new condition. Seen running.—A. UNDERWOOD, 3, Queen Street, E.C. 7963

UNIVERSAL Testing Set, Insulation and Voltage tests, Magneto or supply voltage, cheap, new.—W.S., 26, Haydon Park Road, Wimbledon. 2525

7½-H.P., 220-volt, totally-enclosed Verity Motor, quite new. Also 12-H.P. protected Motor, compound wound.—DRUMMOND AND Co., Commercial Street, Middlesbrough. 7875

8-WAY Distribution Board and water-proof C.I. Case, 34″ × 31″, with safety fuses for 8 motors, 20-100 amps, as good as new, £8.—R. BECKER & Co., LTD., 53, City Road, E.C. 7896

10/11-B.H.P. horizontal Gas Engine by Westinghouse, type B.E. 4, with magneto, electric lighting type, complete with tank and all fittings; only run intermittently over four years.—DRUMMOND & Co., Commercial Street, Middlesbrough. 7871

15-KW., 100-volt, 150-amp., compound-wound, 6-pole Dynamo, three-bearing type with pulley. Little used.—DRUMMOND AND Co., Commercial Street, Middlesbrough. 7874

25-H.P. Motor, 100 volts, as new; £70.—2477, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

25-H.P. Siemens Motor, perfectly new, 400 volts D.C. shunt wound, 955 R.P.M., type 180 F.C., No. 55337.—BAUGHAN, LTD., Reading. 7961

25-H.P., 3-phase, 25-period, 440-volt Motor, 450 R.P.M.; totally enclosed, with starter.—MARTINS, 320, Witton Road, Birmingham. 2546

28 AND 34-H.P., 500-volt, direct-current Motors (by Dick, Kerr and Co.), complete with Starters, cheap.—PHŒNIX Co., 32—36, Broomielaw, Glasgow. 7948

40-H.P. and 50-H.P. Alternating Motors, 2-phase, 50 periods, 400 or 200 volts, 3-wire or 4-wire system, about 480 revolutions per min., with starters, slide rails and pulleys in excellent condition, guaranteed.—Further particulars and price from 2485, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

42-H.P., 220-volt, series-wound Crane Motor; also 25-H.P., Tramway Suspension-type ditto. Both Westinghouse and totally enclosed.—DRUMMOND & Co., Middlesbrough. 2536

90-KW. Steam Generating Set, enclosed compound engine by Ernest Scott & Mountain, coupled to modern interpole D.C. generator, 500 volts. Immediate delivery.—HARRY H. GARDAM & Co., LTD., Staines. 7863

120-H.P., three-phase, 40-period Motor for sale, 440 volts, slip-ring wound rotor, all accessories, immediate delivery.—JENNINGS, West Walls, Newcastle-on-Tyne. 7905

300-KW. Generator, by Westinghouse, 500 volts D.C., 320 R.P.M., three-bearing machine, with rope pulley.—HARRY H. GARDAM & Co., LTD., Staines. 6642

440-VOLT Motors, 2, 2½, 7½, 10, 22, 28, 150-B.H.P.; cheap.—7946, ELECTRICAL REVIEW, 4, Ludgate London.

500-KW. Willans & Siemens Turbo-generating Set, 500 volts, 3-phase, 50~, 3,000 R.P.M.—R. WALKER, 2, Oswald Street, Glasgow. 7106

BUSINESSES FOR SALE AND WANTED.

Cheap prepaid Advertisements are inserted under this heading at the rate of One Penny Per Word (minimum 1s.). Three Consecutive Insertions for the price of two, if ordered and prepaid with first insertion.
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FOR Sale. — Electrical Contractors' Business and Sale Shop (High-Class), established nine years. Plenty of work, both installation for power, lighting, bells and telephones. Turnover for last two years about £1,700 per year. Suit practical man. Low expenses. Owner retiring owing to eyesight troubles. Principals only. Price about £500, including stock and plant. Freehold of shop and dwelling-house can be purchased if desired. —Reply in first instance to 7911, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

ARTICLES WANTED.

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ACCUMULATORS wanted for refining purposes. Obsolete Generating Sets, Dynamos, Motors, and all kinds of Machinery. Scrap Cable, Arc Lamps, Meters, Metal Residues, and Scrap Metals of every description purchased for prompt cash, town or country.—Apply A. BROWN & SONS, 142, Lower Clapton Road, London, N.E. Telephone, Dalston, 555. Telegrams, Secondhand, Lowclap, London. Established 1860. 2092

A QUANTITY of old Hellesen Cells, type 6, wanted.—120, Lordship Lane, Wood Green, London. 2482

A.C. and D.C. Motors (second-hand), any type, any condition, wanted for prompt cash.—A. LEAROYD & SON, Bridge Works, Heatherley Street, Clapton, N.E. 2060

A. LEAROYD & Son, Bridge Works, Clapton, N.E.—Telephone Dalston, 2278; Telegrams: Frangible, Lowclap, London—buys for prompt cash every description of second-hand Generating Sets, Accumulators, Motors, Transformers, old Arc Lamps, Meters, Cable, Scrap Metals, Metallic Drosses, &c., &c. Enquiries solicited. Established over 50 years. 2061

ALL kinds of disused Plant, Machinery, Scrap Metals, &c., purchased for cash. If you have any Generating Sets, Motor Dynamos, Steam Engines, Boilers, &c., you wish to dispose of, kindly offer same to us. Complete works purchased for dismantling.—HARRY H. GARDAM & Co., LTD., Staines. Telephone, Staines 98. 8579

DYNAMOS, Motors, Arc Lamps, Meters, Scrap Cable, Iron Metals or machinery, purchased for cash in any quantities.—J. HYAMS, 11, Glengall Terrace, Old Kent Road, S.E. Telephone: 3339 Hop. 2336

ENGINE and Generator wanted, direct coupled, high speed, 300/350 H.P., 220 volts, 150 lbs. pressure, non-condensing.—7955, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

GENERATOR wanted, modern type multipolar, 30-KW., compound wound, 200 volts; speed 600 or under.—7932, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

G. H. CHAPPELL, SONS & Co., Midland Wharves, Lea Bridge Road, Leyton, N.E. Telephone: Walthamstow 500.—Cash buyers of every description of obsolete Dynamos, Motors, Generating Sets, Cable, &c.; Steam, Hydraulic and Electrical Machinery, Scrap Metals, &c.—'Phone or write us. Established 40 years. 2491

LAMPS, 230, 250 volts, drawn wire metal filament, several thousand wanted, 30 and 60 watts. Must be cheap. State make and quantity offered.—2539, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

MOTORS wanted immediately, 400 volts, three-phase, 50-periods, either slip-ring or squirrel cage, with Auto-Transformer Starters, 5, 6, 8, 10, 20, 25, 30-H.P., or nearest. Good second-hand preferred.—7865, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

MOTORS Wanted, 420-volt, 85 cycles, single-phase: two 50-H.P., two 30-H.P., two 20-H.P.—7953, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

OIL Engine wanted, about 9-B.H.P., good maker, first-class condition essential. — RIDOUT & RATCLIFF, LTD., Electrical Engineers, 42, Upper Baker Street, London, N.W. 2474

OLD Electric Lamp Caps Wanted.—Metal Filaments, 35s. 1000. Carbons, 15s. 1000. Best prices given for Platinum, or Scrap Materials containing Platinum. Also Brass, Copper, Zinc and other Metals wanted. Spot cash.—H. SCHNEIDER, 12, St. George Street, London, E. 1. Telephone: 3605 Ave. 2412

OLD Electric Lamp Tops wanted in any quantities; metal filaments 35s. per 1,000, Carbon 15s. 1,000 or 70s. per cwt. for mixed tops. Scrap Platinum £12 per oz., Mercury 3s. 6d. per lb., old Cable 40s. cwt., scrap Copper 90s. cwt., Brass 70s. cwt. Best price given for old gold, jewellery and false teeth. Cash by return for goods received.—LEE, 56, Green Street, Bethnal Green, London. 2528

PLATINUM, in any form and quantity, purchased at highest prices by DERBY & Co., LTD., 44, Clerkenwell Road, London.

PLATINUM Scrap purchased in large or small quantities; highest value paid. Before selling elsewhere, call or post to THE DEPOT, 156, Charing Cross Road, London, the old and reliable advertisers. Established 1850. 2533

SECONDHAND, cotton-covered, silk-covered, or enamelled Copper Wire, from 26 to 34 S.W.G.; perfect covering not essential. Send sample, price and quantity available.—2454, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

SECONDHAND Electric Plant wanted for lighting private house. —7945, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

(Continued on next page.)

ARTICLES WANTED.—*Continued.*

WANTED, a Millivolt Meter.—"A. J.," 13, Sunninghill Terrace, Llanelly. 2550

WANTED, a set of second-hand Accumulators, in good condition, for 50 v., about 30 amps., for 9 hrs.; also 20 yds. 7/14's Twin or Concentric Cable, suitable for laying direct in the ground for 200 volts.—7957, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

WANTED, Generating Sets, all sizes, Boilers, Accumulators, Dynamos, &c., for export; also Scrap Cable and Metals. Complete plants purchased.—WILLIAMS & SONS, 37, Queen Victoria Street, London. Telephone, 3938 City. 7000

WANTED, Motor, 20 H.P., semi-enclosed, 440 volts D.C., about 800 revs. with pulley.—2524, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

WANTED, Motors and Dynamos, Motor-Generators, Boosters and Accumulators.—MARTINS, 320, Witton Road, Birmingham. 2544

WANTED, several A.C. Motor Auto-Starters, 10/50 H.P., 200/220 volts, 3-phase, 50-cycle circuits.—Full particulars to THE BRADFORD DYERS' ASSOCIATION, LTD., 39, Well Street, Bradford. 7928

WANTED, Small Plant. Oil engine, dynamo, switchboard and 54 cells, about 150 amp.-hours.—State full particulars to 2541, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

WANTED, three 1½-in. to 4-in. Spark Coils to work off 4 volts. Good make essential.—SIMMS MOTOR UNITS, LTD., Percy Buildings, Gresse Street, Rathbone Place, W. 1. 7930

WANTED, ¾ or 1 horse-power Motor, Electric, 230 volts direct with starter; must be in working condition.—2434 ELECTRICAL REVIEW, 4, Ludgate Hill, London.

WANTED, 2-H.P., 230-volt Shunt Motor.—NORTHERN ELECTRICAL, Grimsby. 2534

20-B.H.P., single-phase, 50-period, 200-volt Motor.—Quote, giving full particulars, to 2439, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

200-V., 50-cycle Motor-Generator to 100-v. D.C., about 1½ or 2 H.P. 230-v. D.C. Generator, shunt-wound, with regulator, 12 to 15 amps.; also Meters and change-over Switch.—Apply stating make, age and condition, TOLSON, Engineer, Holmfirth, Yorks. 2480

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WOODWORK.

LARGE Firm in London area, with big quantities of mahogany and walnut off-cuts, want contracts for small case work, motor-car tool boxes, battery or similar cases; small hardwood work of any character.

Send your enquiries to 7840, ELECTRICAL REVIEW, 4, Ludgate Hill, London, E.C. 4.

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THE CRAVEN AND DISTRICT TELEPHONE AND ELECTRIC CO.,
Skipton. 2443

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ADVERTISERS, with workshop in Central London, are open to additional contracts for small polished condenser boxes. Modern methods and plant.—2537, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

SMALL electrical constructional work wanted for machine shop and mechanical department.—7890, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

WANTED, firms, preferably in the London district, who can take up the machining of vulcanite mouldings to limit gauge and micrometer for electrical instrument work. A continuous business is offered.—SIMMS MOTOR UNITS, LTD., Gresse Street, Rathbone Place, W. 7861

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Telephone: Museum 333.

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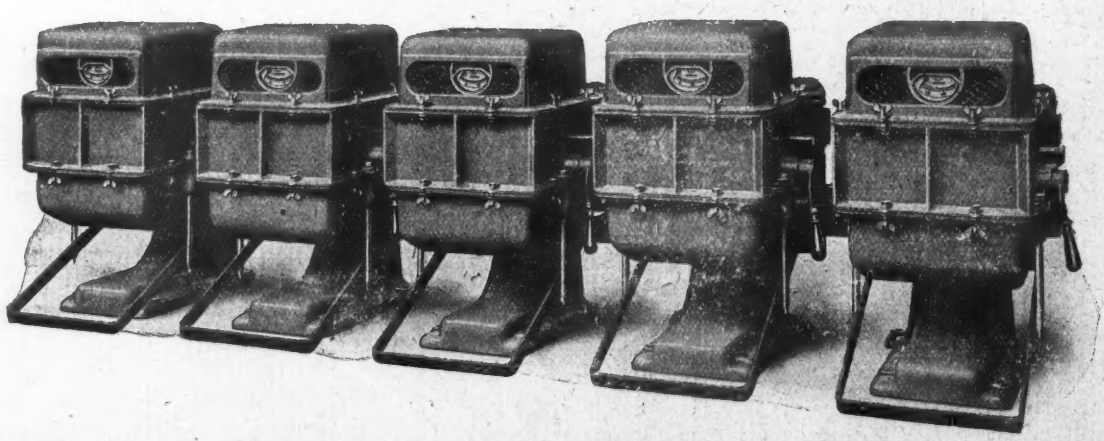

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Telephone:- BRIXTON, 2075.
Telegrams:- "ELAPRATUS LONDON," A.B.C. CODE. 5TH EDITION.
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NEWCASTLE-ON-TYNE. 28, ELDON STREET. CITY, 437.

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MONDAY MORNING.

The ELECTRICAL REVIEW is the recognised Medium of the Electrical Trades, and has **BY FAR THE LARGEST CIRCULATION** of any Electrical Industrial Paper in Great Britain.

NOTICES RELATING TO PATENTS.

Latest time for receiving 9.30 a.m. Thursday.

John E. Raworth,

Queen Anne's Chambers
28, The Broadway, Westminster, S.W. Chartered Patent Agent.

OFFICIAL NOTICES.

Latest time for receiving 9.30 a.m. Thursday.

IN THE MATTER OF THE TRADING WITH THE ENEMY AMENDMENT ACT, 1916.

THE PUBLIC TRUSTEE invites Tenders for the purchase of the whole or any part of 119,660 Shares of £5 each, fully paid, in Siemens Brothers & Company, Limited, vested in him as Custodian by an Order made by the Board of Trade in pursuance of Section 4 of the Trading with the Enemy Amendment Act, 1916, and dated August 9th, 1916.

The issued capital of the Company consists of 120,000 shares of £5 each, fully paid.

The purchasers, who must be British-born subjects, will be required to make a sworn declaration as to nationality and freedom from foreign control on a form to be obtained from the Offices of the Public Trustee.

The purchasers will also be required to satisfy the Public Trustee as to their financial and technical ability to carry on the business of the Company as efficiently as heretofore, or otherwise to the satisfaction of the Government.

A report upon the Company's operations and affairs has been prepared by the Company, in conjunction with the Company's auditors (Messrs. Price, Waterhouse & Co.) and with Messrs. Turquand Youngs & Co. Copies of this report can be obtained, subject as hereinafter mentioned, together with copies of the Company's accounts up to the 31st December, 1915, on written application to the Public Trustee, Kingsway, W.C.

All applicants will be required to satisfy the Public Trustee as to any matter which he may think fit to investigate before copies of such report or accounts will be supplied.

Intending tenderers who desire to inspect the property of the Company should apply to the Public Trustee for an authority to do so.

Tenders must be delivered, sealed, to the Public Trustee, Kingsway, W.C., on or before THURSDAY, the 12th JULY, 1917 (not 14th June, as previously advertised), at 12 o'clock noon, and marked on the envelope, "Tender, Siemens Shares."

The Public Trustee does not bind himself to accept any Tender, and reserves to himself all rights in connection therewith. Forms of Tender can be obtained from the Public Trustee.

Dated this 8th day of February, 1917.

O. J. STEWART,
Public Trustee.
7296 *Custodian for England and Wales.*

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ELECTRICAL REVIEW.

BINDINGS AND CASES.—Subscribers and others can have their half-yearly numbers bound handsomely in Black Cloth at the rate of 4s. per annum. Cases for binding are also supplied at 2s. 6d. each.—4, Ludgate Hill, E.C. 4

The
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should be in every Generating, Transforming and Motor House.

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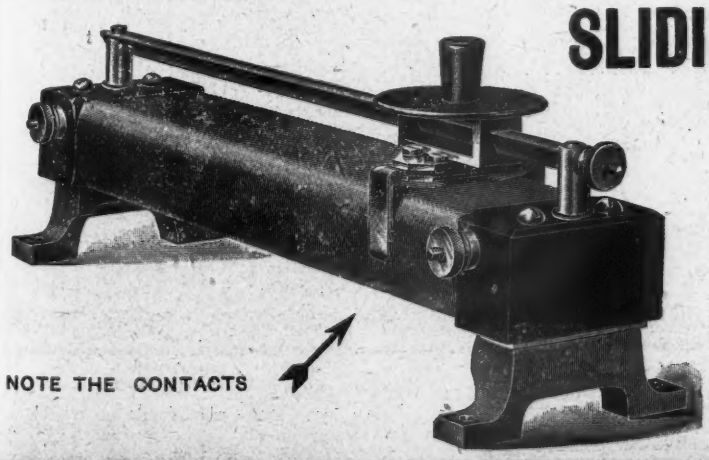

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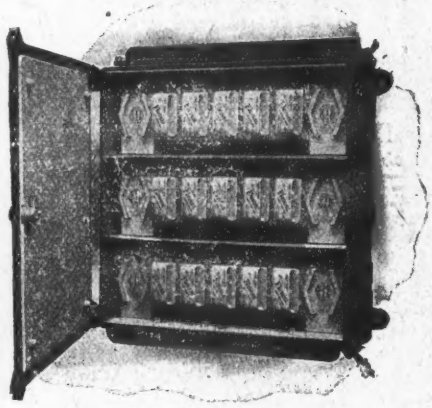

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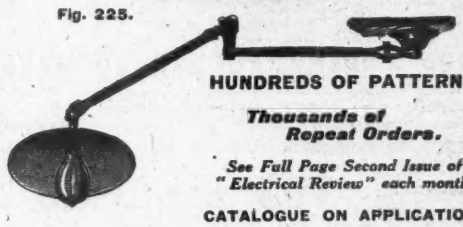
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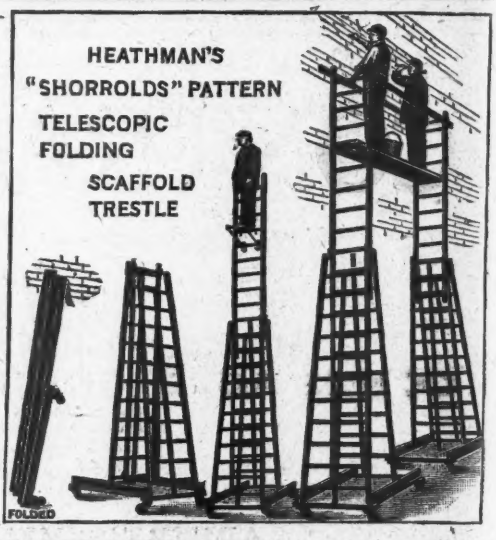
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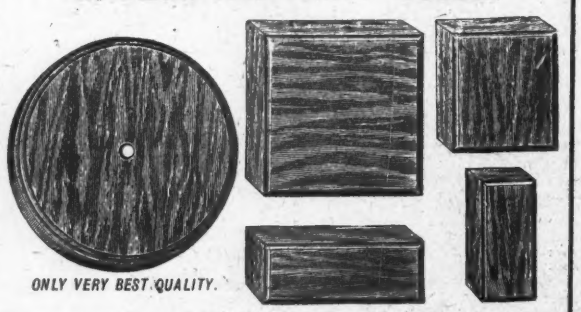
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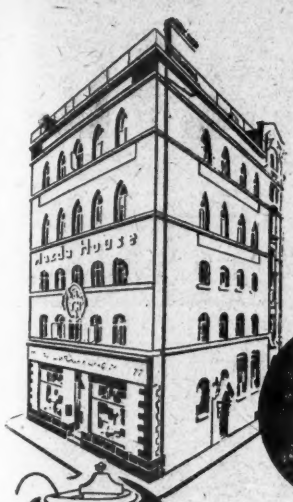

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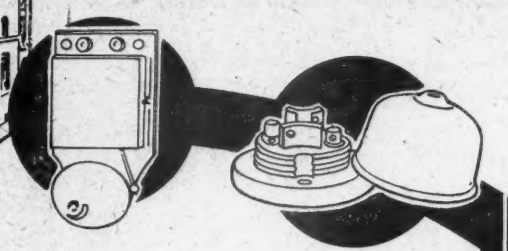

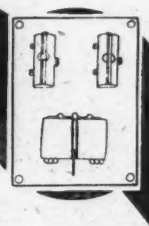

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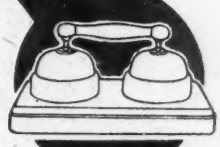

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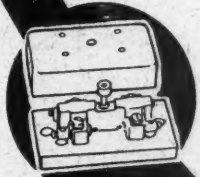

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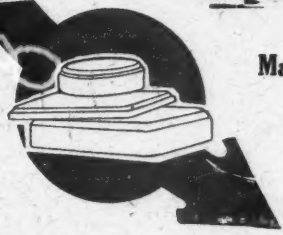

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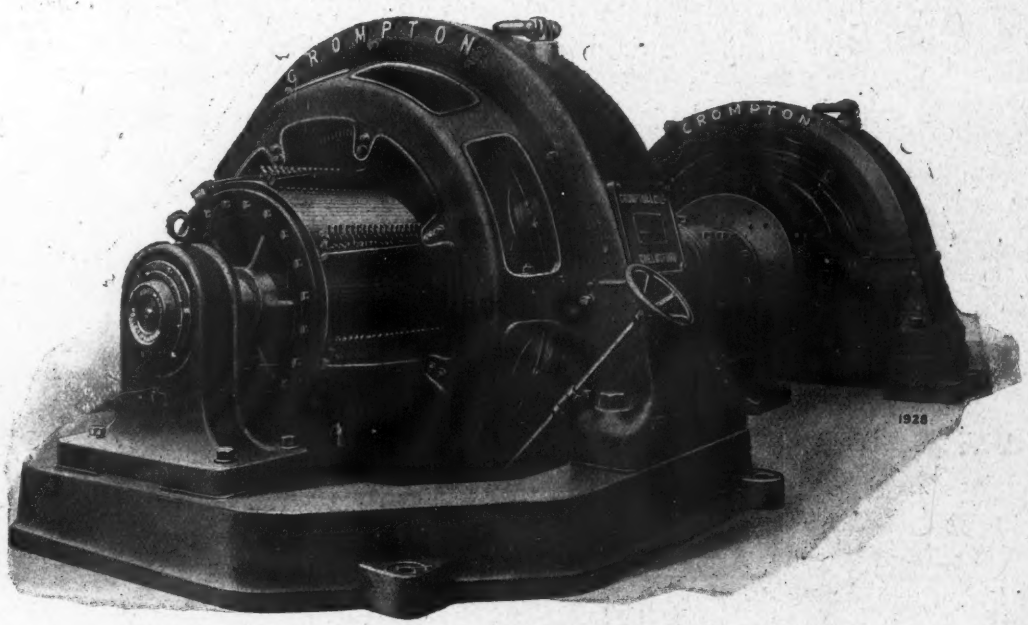

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Due to the fact that they are easy to sell, that they show a good profit when sold, and they give your customer satisfaction.

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Due to the fact that they undoubtedly save work, save dirt, save coal, and effect economies in every direction.

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They form the modern and hygienic method of preparing food.

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We can Supply You with the Articles to enable your Consumers to use it.

(These are made by girls, so not interrupting our war service work, and from materials of which there is an abundant supply, after all war service demands have been met.)

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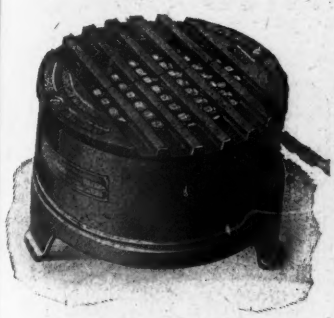
Secondly, definite steps have to be taken to see what, under present circumstances, can be done in the way of bringing Belling Boilers, Grillers and Ovens before your Consumers.



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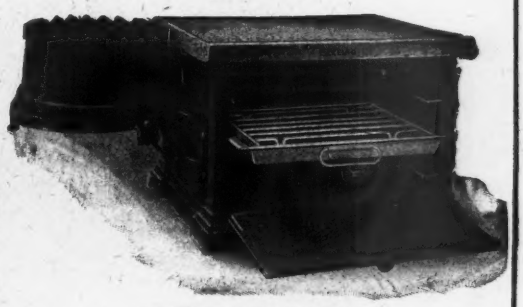

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To have a War Economy Exhibition.

To advertise the Exhibition in the local papers.

To get a smart lady demonstrator calling on Consumers with a sample Boiler which can be left for a week's trial, etc., etc.

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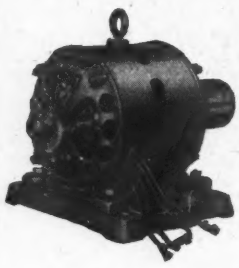

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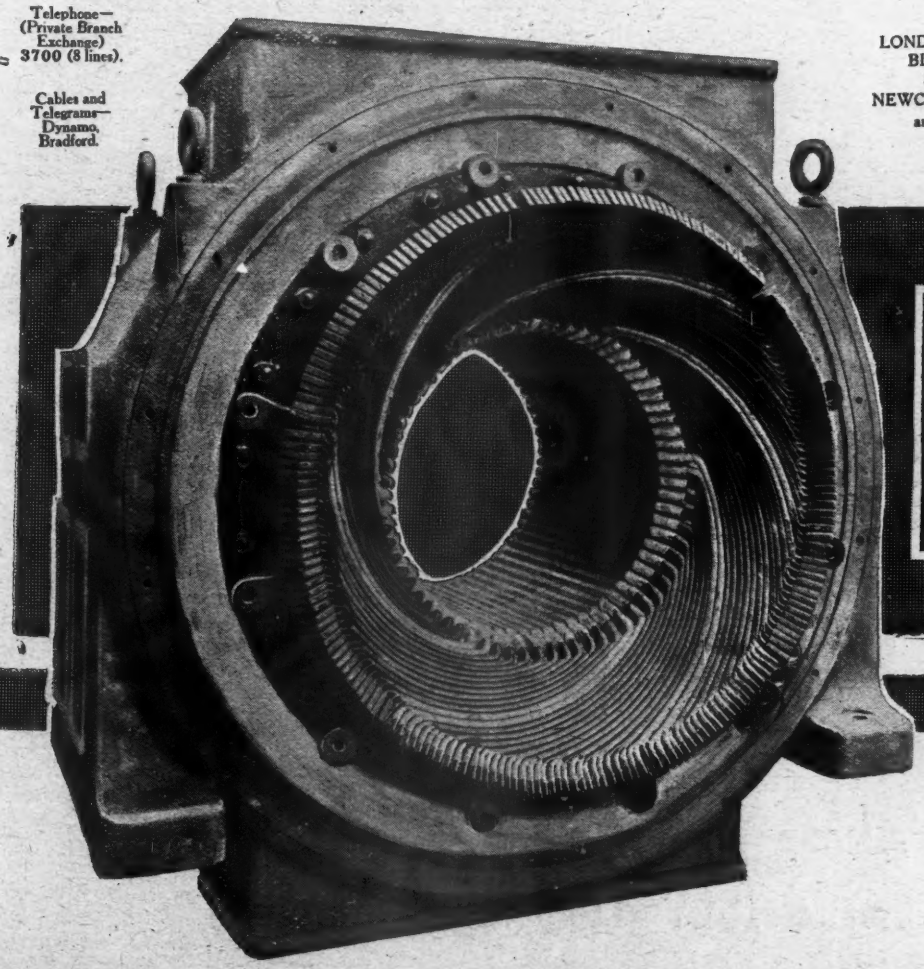

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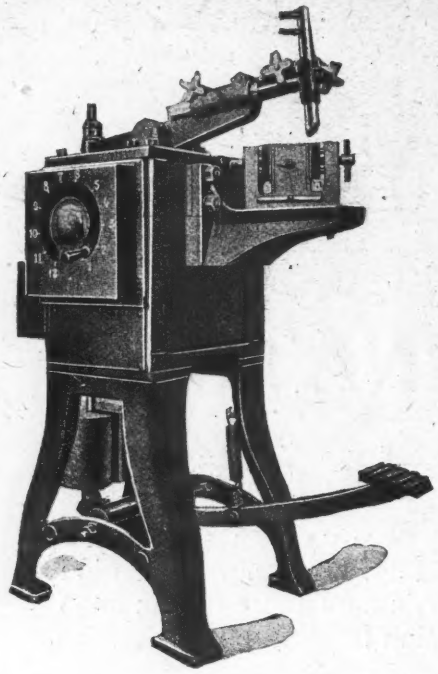

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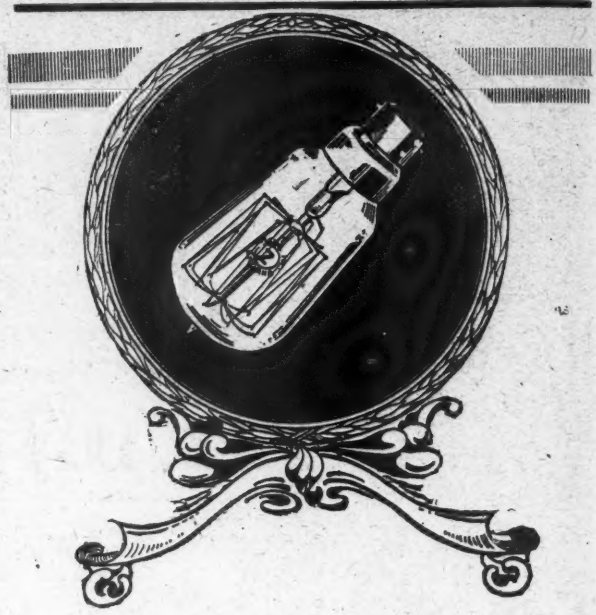

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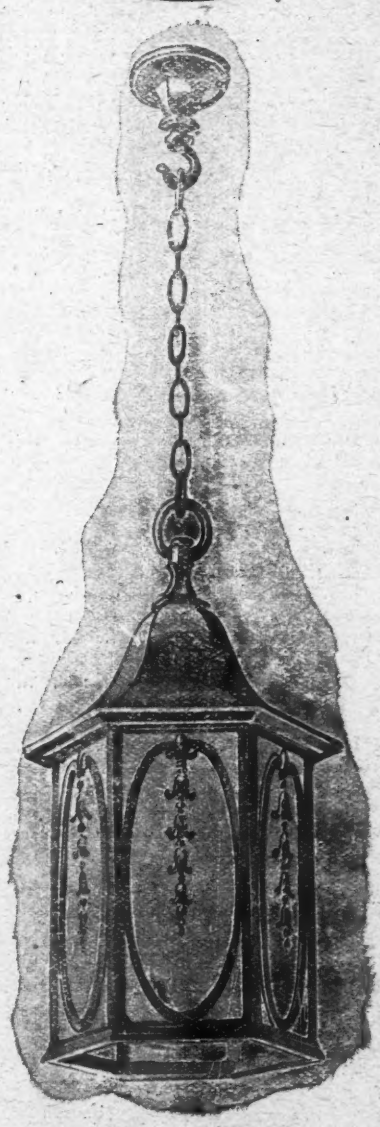

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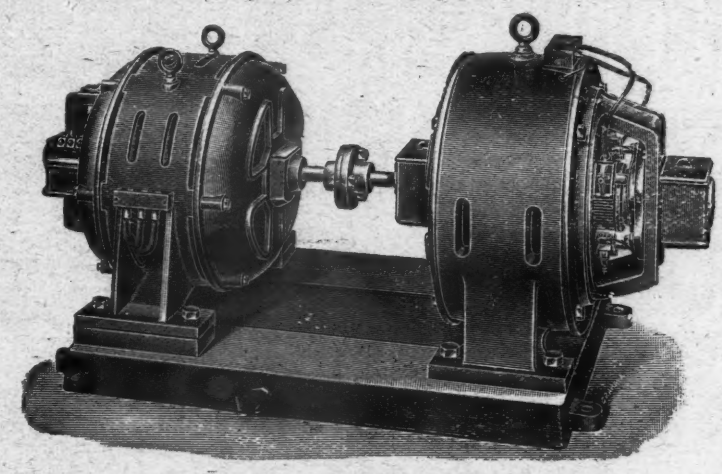

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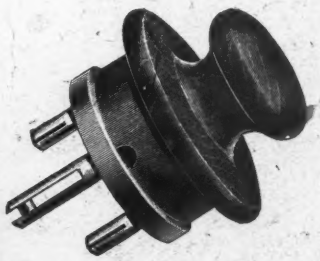

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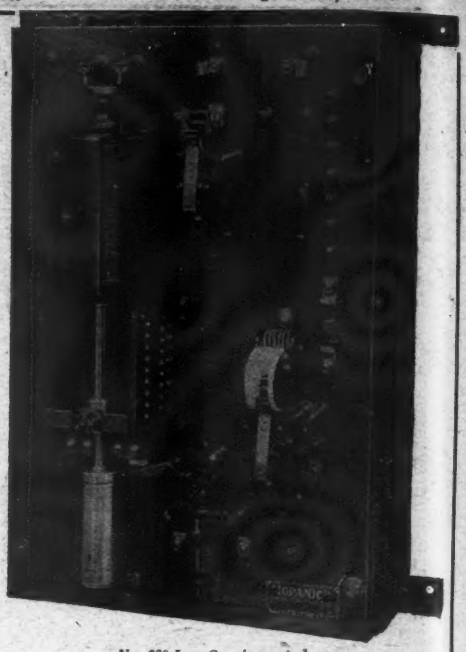

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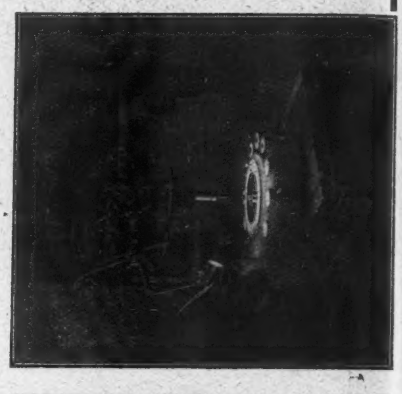

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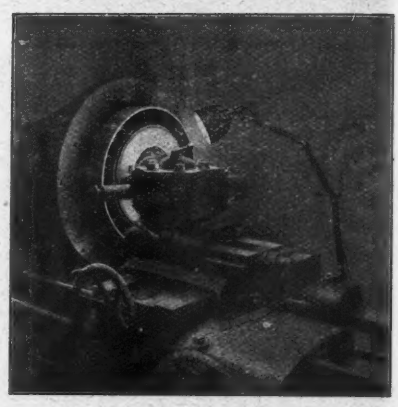

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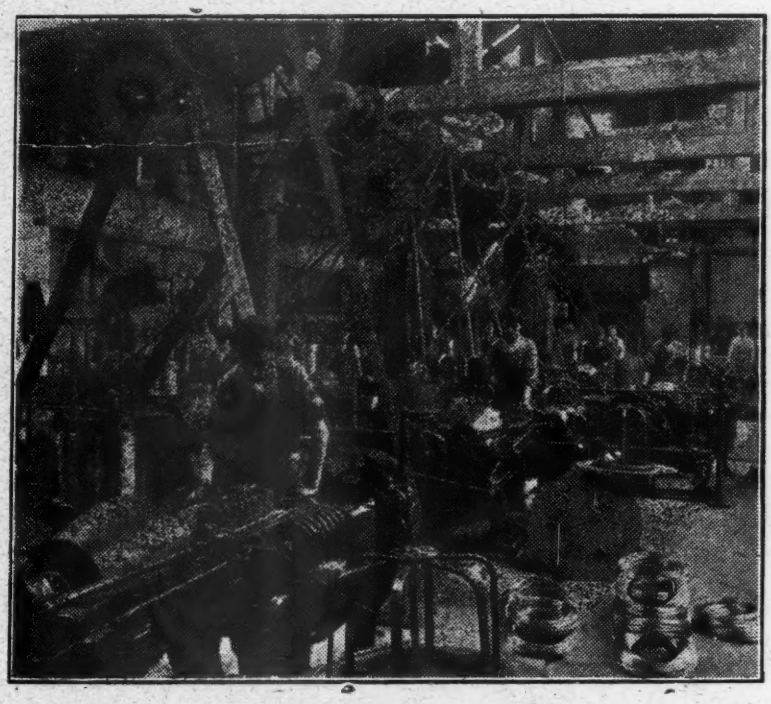

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(3)

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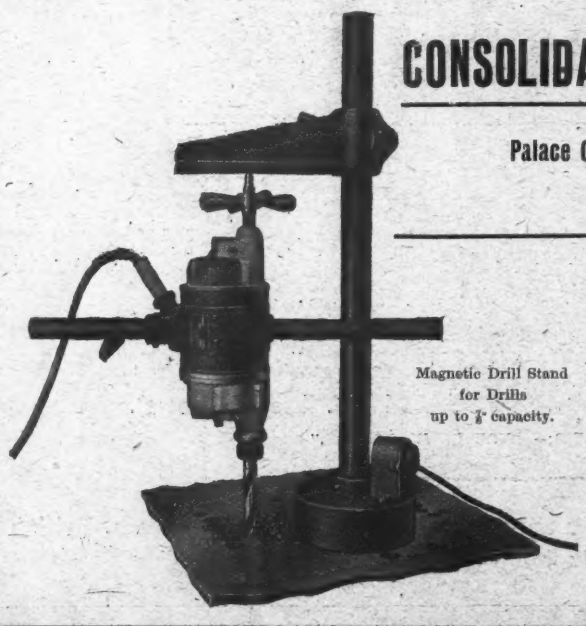
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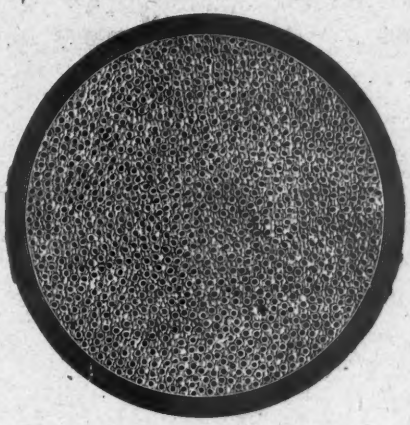

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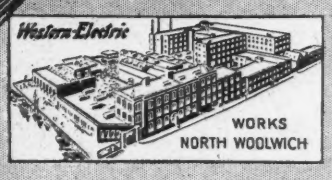

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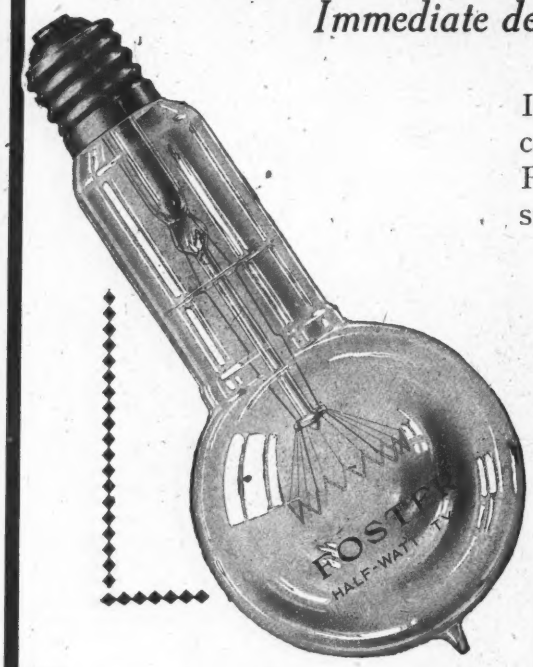

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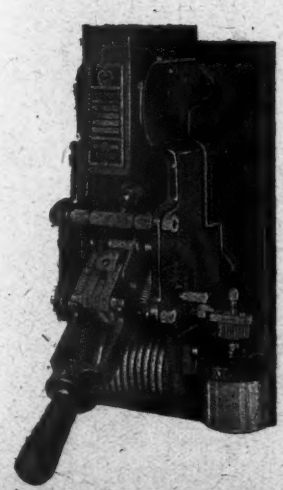

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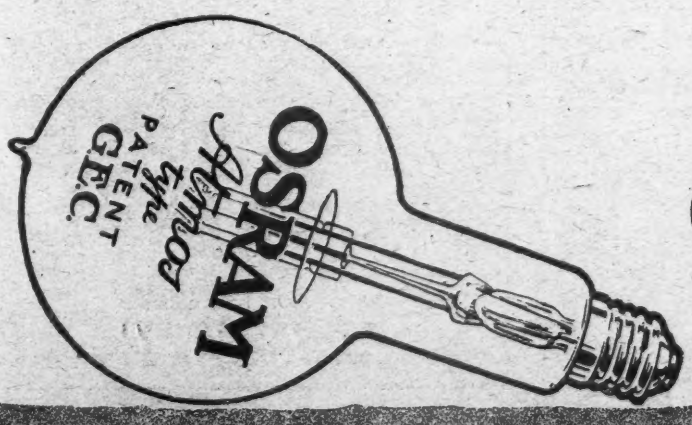

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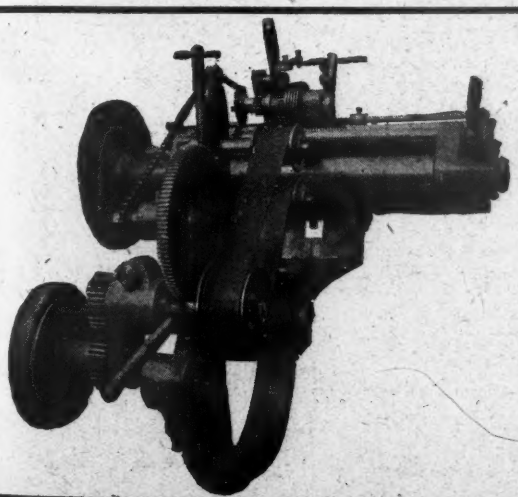

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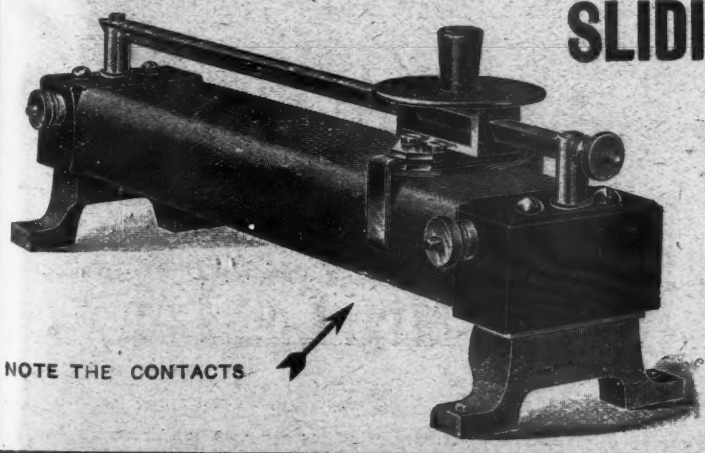

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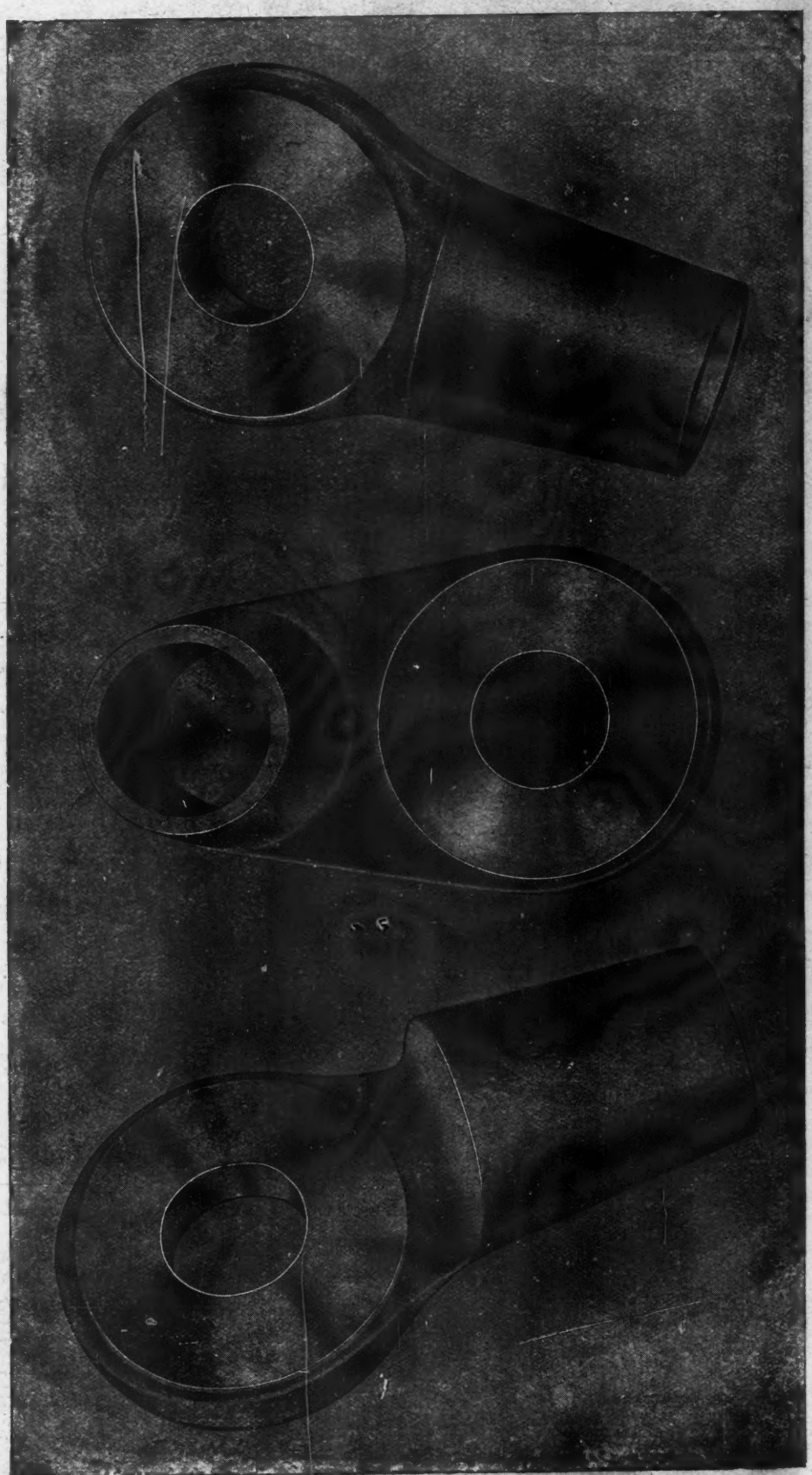

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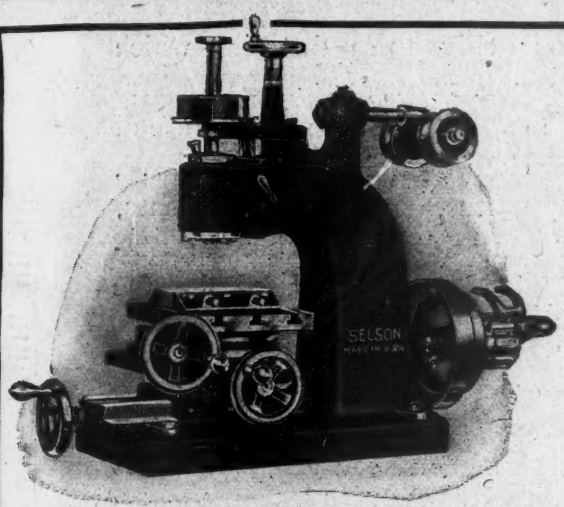

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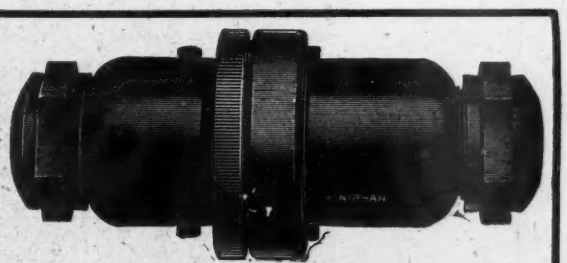

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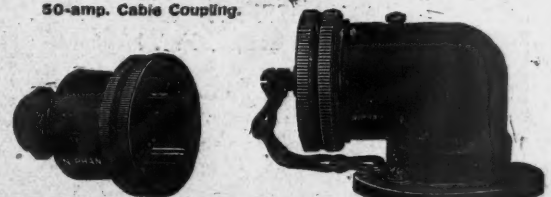

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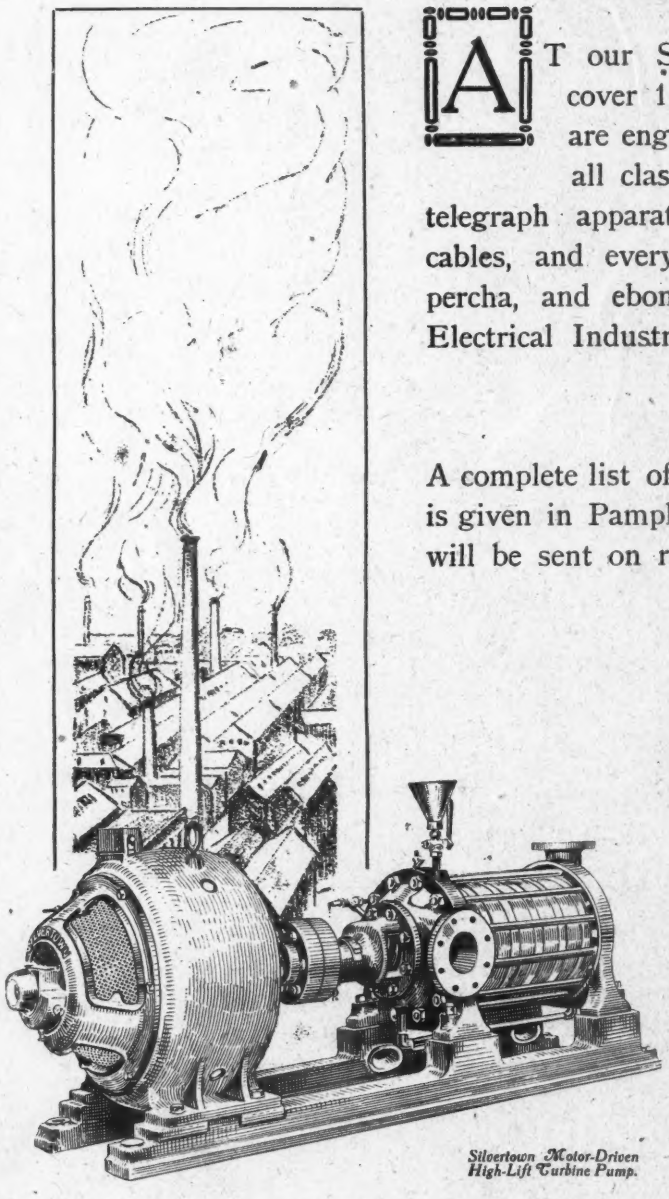

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